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COMMONWEALTH OF INDEPENDENT STATES AEROSPACE SCIENCE AND TECHNOLOGY 1992

A BIBLIOGRAPHY WITH INDEXES

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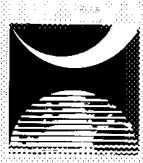

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COMMONWEALTH OF INDEPENDENT STATES AEROSPACE SCIENCE AND TECHNOLOGY 1992

A BIBLIOGRAPHY WITH INDEXES

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1993

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INTRODUCTION

The technical literature covered in this bibliography describes selected research and development from the thirteen countries now making up the Commonwealth of Independent States (CIS), which was formerly referred to as the USSR. The purpose of this bibliography is to assist R&D efforts and thus, increase productivity of NASA scientists and engineers. However, not all thirteen countries may have documented their R&D during the past year, therefore no citations may appear in this issue from every one. The references were compiled from the NASA Scientific and Technical Information Database using both astronautical and aeronautical terms, as well as the country of intellectual origin itself. The coverage was limited to items accessioned in 1992. For current aeronautical engineering worldwide coverage, refer to the monthly *Aeronautical Engineering* bibliography, NASA SP-7037, or search the NASA RECON online retrieval system.

Each entry in the bibliography consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR/IAA* subject categories. A subject index further identifies subject areas of specific interest. In addition to the subject index, this bibliography provides an author index, a corporate source index, a contract number index, a foreign technology index, a report number index, and an accession number index. Each index entry includes the accession number and the page number, to assist the user in locating the full citation in the abstract section.

Other foreign technology bibliographies of possible interest include:

Current European Aeronautics 1983-1985, NASA SP-7055
European Aeronautics and Astronautics, NASA SP-7058 (1985)
European Aeronautics and Astronautics 1986, NASA SP-7061
European Science and Technology 1987, NASA SP-7068
European Aerospace Science and Technology 1988, NASA SP-7076
European Aerospace Science and Technology 1989, NASA SP-7082
European Aerospace Science and Technology 1990, NASA SP-7094
European Aerospace Science and Technology 1991, NASA SP-7099
European Aerospace Science and Technology 1992, NASA SP-7105
Japanese Science and Technology 1983-1984, NASA SP-7054
Japanese Science and Technology, NASA SP-7057 (1985)
Japanese Science and Technology 1986, NASA SP-7060
Japanese Science and Technology 1987, NASA SP-7067
Japanese Aerospace Science and Technology 1988, NASA SP-7075
Japanese Aerospace Science and Technology 1989, NASA SP-7081
Japanese Aerospace Science and Technology 1990, NASA SP-7093
Japanese Aerospace Science and Technology 1991, NASA SP-7100
Japanese Aerospace Science and Technology 1992, NASA SP-7104
Soviet Aeronautics, NASA SP-7052 (1984)
Soviet Aeronautics and Astronautics, NASA SP-7059 (1985)
Soviet Aeronautics and Astronautics 1986, NASA SP-7062
Soviet Science and Technology 1987, NASA SP-7066
Soviet Aerospace Science and Technology 1988, NASA SP-7077
Soviet Aerospace Science and Technology 1989, NASA SP-7083
Soviet Aerospace Science and Technology 1990, NASA SP-7095
Commonwealth of Independent States (CIS) Aerospace Science and Technology 1991, NASA SP-7101

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N.A.—No abstracts were assigned to this category for this issue.

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APPENDIX **APP-1**

German-Russian cooperation in the development of aircraft technologies is discussed. Emphasis is given to plans for a hydrogen-fueled 'cryoplane' and the MTU-CRISP propfan. The economic costs of these developments are addressed. C.D.

A92-47821
CIS ENGINES. I - THE RANGE REVEALED
KEN FULTON Air International (ISSN 0306-5634), vol. 43, no. 1, July 1992, p. 34-39. Jul. 1992 6 p
Copyright
A review is presented of the background and development of current production engines being offered by the aerospace industries of Russia and Ukraine. The restructuring of the various principal engine design bureaus, manufacturing plants, and the aggregate plants producing engine fuel and control system components, and other system devices is described. Current gas turbine and piston engines are listed showing maximum takeoff thrust and aircraft applications. R.E.P.

A92-53250
RUSSIAN REALITIES
PAUL DUFFY Flight International (ISSN 0015-3710), vol. 142, no. 4329, July 29, 1992, p. 23-25. 29 Jul. 1992 3 p
Copyright
An overview is presented of the Aviastar Aviation Complex in Ulyanovsk to evaluate how this organization has faced up to the changing political and economic circumstances affecting the aviation industry in Russia. Attention is given to the restructuring, not only of the basic infrastructure of the complex, but of the personnel/management organization which is now based on Western design, development and manufacturing system guidelines. Consideration is given to the ongoing negotiations with other international aeronautics firms and to the projects currently being pursued including the Thermoplane, a rigid-structure airship heavylifter. R.E.P.

02

AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

A92-10825
NONSTATIONARY FORCES ON A WING AIRFOIL [NESTATSIONARNYE SILY NA KRYLOVOM, OBTEKAEMOM PROFILE]
IU. L. LEVKOVSKII and IU. S. CHEKALOVA (Tsentral'nyi Nauchno-Issledovatel'skii Institut imeni A.N. Krylova, Leningrad, USSR) Akusticheskii Zhurnal (ISSN 0320-7919), vol. 37, May-June 1991, p. 505-511. In Russian. Jun. 1991 7 p In RUSSIAN refs
Copyright
The paper is concerned with the problem of determining the nonstationary drag force acting on an airfoil of finite thickness in nonstationary flow. This force can be determined by solving a problem similar to the well known Sears problem concerning a nonstationary lifting force on a flat plate. In the present case, however, the tangential velocity component is important. Changes in the nonstationary drag force are analyzed as a function of the geometrical parameters of the wing. V.L.

A92-10901
AN EXPERIMENTAL STUDY OF SUBSONIC SEPARATED FLOW OVER PARAWINGS [EKSPERIMENTAL'NYE ISSLEDOVANIIA DOZVUKOVOGO SRYVNOGO OBTEKANIIA DEL'TOPLANOV]
V. I. VORONIN and A. I. SHVETS Moskovskii Universitet, Vestnik, Seriia 1 - Matematika, Mekhanika (ISSN 0579-9368), May-June 1991, p. 84-86. In Russian. Jun. 1991 3 p In RUSSIAN refs
Copyright
Results of experimental studies of the aerodynamic characteristics of parawing models are reported, covering a wide range of angles of attack under conditions of separated flow. It is shown, in particular, that as the free-stream Mach number increases from 0.4 to 0.8, the lifting force and pressure center coefficients increase by 5 percent, with a slight decrease in the lift-drag ratio. The model characteristics and details of the experimental procedure are described. V.L.

A92-10907
TWO-PHASE FLOWS AT SUPERSONIC VELOCITIES [DVUKHFAZNYE TECHENIIA PRI SVERKHZVUKOVYKH SKOROSTIAKH]
O. A. POVAROV and V. A. FILIPPENKO (Moskovskii Energeticheskii Institut, Moscow, USSR) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 29, July-Aug. 1991, p. 738-744. In Russian. Aug. 1991 7 p In RUSSIAN refs
Copyright
The paper deals with the interaction between a shock wave and a two-phase vapor flow. Measurements of changes in the disperse composition of wet steam behind the shock wave are presented for different flow velocities. An analysis is made of a reduction in the erosion wear of specimens in supersonic flow of wet steam resulting from the fractionation of liquid particles in the shock wave. V.L.

A92-10908
VIBRATIONAL RELAXATION TIMES AT HIGH TEMPERATURES AND THEIR EFFECT ON HEAT TRANSFER [VREMENA KOLEBATEL'NOI RELAKSATSII PRI VYSOKIKH TEMPERATURAKH I IKH VLIIANIE NA TEPLOOBMEN]
V. G. SHCHERBAK (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 29, July-Aug. 1991, p. 781-787. In Russian. Aug. 1991 7 p In RUSSIAN refs
Copyright
An analysis is made of hypersonic flow past bodies moving along gliding trajectories during their entry into the terrestrial atmosphere. The vibrational relaxation times at temperatures above 8000 K are approximated by the Lifshitz formula and the reverse frequency formula with an effective molecule collision cross section. The effect of different approximations on the heat flow, temperature, and concentration profiles is demonstrated. V.L.

A92-12164
PRESSURE ON A CYLINDER WITH A SCREEN IN TRANSVERSE FLOW [DAVLENIE NA POPERECHNO OBTEKAEMOM TSILINDRE S EKRANOM]
N. M. BYCHKOV, N. D. DIKOVSKAIA, and V. V. LARICHKIN (AN SSSR, Institut Teoreticheskoi i Prikladnoi Mekhaniki, Novosibirsk, USSR) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0002-3434), Jan.-Feb. 1991, p. 72-79. In Russian. Feb. 1991 8 p In RUSSIAN refs
Copyright
Transverse flow past a cylinder near a plane surface was investigated experimentally in a subsonic wind tunnel for relatively small distances between the cylinder and the plane surface (h equals less than 0.1 of the cylinder diameter) and Reynolds numbers up to 6 x 10 exp 5. The presence of a positive pressure gradient in front of the cylinder contributes to the formation of a turbulent boundary layer on the plane surface. For h less than 0.06, perturbations from the screen give rise to turbulence on the upper cylinder wall, shifting the separation point further downstream and producing an abrupt increase in the lift force. Flow laminarization for h greater than 0.06 shifts the separation point upstream, leading to a partial channel locking and an anomalous increase in the lift force. V.L.

A92-12169
EVOLUTION OF THREE-DIMENSIONAL FLOWS DURING THE INTERACTION BETWEEN CONICAL SHOCK WAVES AND A TURBULENT BOUNDARY LAYER [RAZVITIE PROSTRANSTVENNYKH TECHENII PRI VZAIMODEISTVII KONICHESKIKH SKACHKOV UPLOTNENIIA S TURBULENTNYM POGRANICHNYM SLOEM]
A. A. ZHELTOVODOV and A. I. MAKSIMOV (AN SSSR, Institut Teoreticheskoi i Prikladnoi Mekhaniki, Novosibirsk, USSR) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0002-3434), Mar.-Apr. 1991, p. 88-98. In Russian. Apr. 1991 11 p In RUSSIAN refs
Copyright

Supersonic flow past half-cones located on a plate was investigated experimentally in a systematic manner in order to gain a better understanding of the evolution of three-dimensional turbulent flows and to compare some of the flow characteristics for different geometrical configurations. The experiments were carried out in a wind tunnel for an adiabatic model surface at free-stream Mach 2.27, 3, and 4. It is found, in particular, that, for moderate intensities of sliding shock waves, flow in the mixing region is characterized by predominantly horizontal deviations of the flow lines. A significant restructuring of the flow observed for high shock wave intensities suggests the formation of a three-dimensional separation. V.L.

A92-12170
COMPARATIVE STUDIES OF FLOW AROUND A WING PROFILE IN TWO WIND TUNNELS [SRAVNITEL'NYE ISSLEDOVANIIA OBTEKANIIA PROFILIA KRYLA V DVUKH AERODINAMICHESKIKH TRUBAKH]
B. IU. ZANIN and V. N. LUSHIN (AN SSSR, Institut Teoreticheskoi i Prikladnoi Mekhaniki, Novosibirsk, USSR) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0002-3434), Mar.-Apr. 1991, p. 99-103. In Russian. Apr. 1991 5 p In RUSSIAN refs
Copyright

The laminar-turbulent transition in the boundary layer on a wing profile was investigated experimentally in two wind tunnels, a commercial wind tunnel and a smaller low-turbulence wind tunnel, T-324. In both wind tunnels, the experiments focused on the measurements of the length of the laminar flow section on the wing surface and on the physical mechanism of the laminar-turbulent transition. Data on the laminar-turbulent transition obtained in the two wind tunnels for moderate and low turbulence are found to be similar. V.L.

A92-12173
COMPARATIVE ANALYSIS OF THE LIFT-DRAG RATIO AND HEAT FLOWS TOWARD THE SURFACE OF WAVE RIDERS OF DIFFERENT CONFIGURATIONS [SRAVNITEL'NYI ANALIZ AERODINAMICHESKOGO KACHESTVA I TEPLOVYKH POTOKOV K POVERKHNOSTI VOLNOLETOV RAZLICHNOI FORMY]
I. I. MAZHUL' and I. I. IAKOVLEV (AN SSSR, Institut Teoreticheskoi i Prikladnoi Mekhaniki, Novosibirsk, USSR) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0002-3434), May-June 1991, p. 73-76. In Russian. Jun. 1991 4 p In RUSSIAN refs
Copyright

A comparative analysis of the aerodynamic characteristics of different types of simple wave riders is made with allowance for constraints on the body surface temperature. Although the requirements for minimizing heat fluxes and maximizing the lift-drag ratio are shown to be contradictory, it is found that, over certain ranges of parameters, configurations can be determined which provide for lower heat fluxes toward the body surface and higher values of the lift-drag ratio. V.L.

A92-12203
MODELING OF THE VORTEX STRUCTURE AT DELTA WINGS OF LOW ASPECT RATIO BY THE DISCRETE VORTEX METHOD [MODELIROVANIE VIKHREVOI STRUKTURY U TREUGOL'NYKH KRYL'EV MALOGO UDLINENIIA METODOM DISKRETNYKH VIKHREI]
N. F. VOROB'EV and G. N. SHASHKINA (AN SSSR, Institut Teoreticheskoi i Prikladnoi Mekhaniki, Novosibirsk, USSR) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0869-1339), July-Aug. 1991, p. 32-35. In Russian. Aug. 1991 4 p In RUSSIAN refs
Copyright

A scheme is proposed which models the formation of a vortex core over a delta wing of low aspect ratio. The approach used is based on the discrete vortex scheme of a thin wing of finite span which allows for the dependence of the intensity of the shed vortex sheet on the leading edge sweep angle. Results of calculations are presented, and it is shown that the scheme remains stable at large angles of attack. V.L.

A92-12204
EXPERIMENTAL AND THEORETICAL STUDY OF THE IMPROVEMENT OF THE AERODYNAMIC CHARACTERISTICS OF SUPERSONIC FLOW PAST BODIES WITH SURFACE INJECTION OF A GAS JET WITH PARTICLES [EKSPERIMENTAL'NOE I TEORETICHESKOE ISSLEDOVANIE ULUCHSHENIIA AERODINAMICHESKIKH KHARAKTERISTIK SVERKHZVUKOVOGO OBTEKANIIA TEL PRI VYDUVE IZ NIKH STRUI GAZA S CHASTITSAMI]
N. P. GRIDNEV, S. S. KATSNEL'SON, V. M. FOMIN, and V. P. FOMICHEV (AN SSSR, Institut Teoreticheskoi i Prikladnoi Mekhaniki, Novosibirsk, USSR) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0869-1339), July-Aug. 1991, p. 36-39. In Russian. Aug. 1991 4 p In RUSSIAN refs
Copyright

Supersonic flow past bodies of revolution is investigated theoretically and experimentally in the case of the local injection of a gas jet with particles from the body surface. The internal structure of such flows is characterized, and it is shown that surface injection of a gas jet with particles makes it possible to decrease the aerodynamic drag to a greater extent than with traditional method, including the injection of a single-phase jet. In the case of bodies moving at high supersonic velocities, the injection of a two-phase jet may also provide an effective method of reducing heat transfer toward the body walls. V.L.

A92-12808
VIBRATION OF A WING OF FINITE SPAN IN SUBSONIC FLOW AT SMALL DISTANCES FROM A SOLID BOUNDARY [KOLEBANIIA KRYLA KONECHNOGO RAZMAKHA V DOZVUKOVOM POTOKE NA MALYKH OTSTOIANIIAKH OT TVERDOI GRANITSY]
I. I. EFREMOV and E. P. LUKASHCHIK (Kievskii Politekhnicheskii Institut, Kiev, Ukrainian SSR) Gidromekhanika (ISSN 0367-4088), no. 63, 1991, p. 55-60. In Russian. 1991 6 p In RUSSIAN refs
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The asymptotic approximation of small distances from a solid boundary is used to obtain an analytical expression relating the lift coefficient to the wing vibration frequency at subsonic flight velocities. The problem is solved by using acceleration potential and solution separation methods. Calculation of lift force components are presented for wings of aspect ratios of 2 and 6 for Mach 0.3 and 0.5. V.L.

A92-13740
EFFECT OF THE REYNOLDS NUMBER ON BOUNDARY LAYER EVOLUTION BEHIND A FAN OF RAREFACTION WAVES [VLIIANIE CHISLA REINOL'DSA NA RAZVITIE POGRANICHNOGO SLOIA ZA VEEROM VOLN RAZREZHENIIA]
M. A. GOL'DFEL'D and I. G. LISENKOV Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), Sept.-Oct. 1991, p. 40-47. In Russian. Oct. 1991 8 p In RUSSIAN refs
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Wind tunnel experiments were carried out to investigate the structure of a boundary layer and its evolution behind a fan of rarefaction waves and to obtain systematic experimental data at large distances from the mixing region. It is found that a decrease in the Reynolds number leads to a significant increase in the

length of the relaxation region in the boundary layer. The inner part of the layer is the most conservative with respect to the effect of pressure gradients (both positive and negative). V.L.

A92-13741
HEAT TRANSFER IN SUPERSONIC FLOW PAST A SINGLE CRATER [TEPLOOBMEN PRI SVERKHZVUKOVOM OBTEKANII ODINOCHNOI LUNKI]
V. IA. BOROVOI and L. V. IAKOVLEV Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), Sept.-Oct. 1991, p. 48-52. In Russian. Oct. 1991 5 p In RUSSIAN refs
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Flow and heat transfer on a plate with a single crater is investigated experimentally for free-stream Mach 4 and a Reynolds number of 3.6 x 10 exp 6. The flow pattern near the crater is determined, and regions with increased heat transfer are identified. Heat transfer coefficients are determined inside the crater and near it. It is shown that a single crater has practically no effect on the integral heat flux. V.L.

A92-13743
HYPERSONIC FLOW PAST A PLATE OF FINITE LENGTH [GIPERZVUKOVOE OBTEKANIE PLASTINY KONECHNOI DLINY]
A. A. KOVALENKO and I. I. LIPATOV Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), Sept.-Oct. 1991, p. 66-73. In Russian. Oct. 1991 8 p In RUSSIAN refs
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Two important factors to be considered in the statement and solution of the problem of symmetric flow past a plate of finite length under conditions of viscous-nonviscous interaction are identified. In particular, the self-similar solution for equations of a hypersonic boundary layer, valid for a semiinfinite plate, is inapplicable in the case of a finite plate; the second factor relates to the presence of a saddle singularity in the solution. Here, an approach to this problem is described, and some calculation results are presented. V.L.

A92-13748
CALCULATION OF THE BASE PRESSURE AND ENTHALPY BEHIND A STEP IN THE PATH OF TWO SUPERSONIC STREAMS WITH ALLOWANCE FOR THE EFFECT OF BOUNDARY LAYERS AND HEAT FLUXES [RASCHET DONNOGO DAVLENIIA I ENTAL'PII ZA USTUPOM, OBTEKAEMYM DVUMIA SVERKHZVUKOVYMI POTOKAMI, S UCHETOM VLIIANIIA POGRANICHNYKH SLOEV I TEPLOVYKH POTOKOV]
V. K. MASALOV and R. K. TAGIROV Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), Sept.-Oct. 1991, p. 167-176. In Russian. Oct. 1991 10 p In RUSSIAN refs
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A relatively simple method is proposed for calculating flow parameters behind a step in the path of two supersonic streams. The method employs the boundary layer approximation and integral mass and energy conservation laws (a viscous-nonviscous interaction model). The method makes it possible to determine the base pressure and the base enthalpy with allowance for the effect of Mach numbers, Reynolds numbers, initial boundary layer thickness, adiabatic exponent, and wall enthalpies for different ratios of the integral pressures and enthalpies of the two streams. V.L.

A92-13749
EXPERIMENTAL STUDIES OF THE INTERACTION OF CONVERGING AXISYMMETRIC SHOCK WAVES WITH SHARP AND BLUNT CONES IN SUPERSONIC FLOW [EKSPERIMENTAL'NYE ISSLEDOVANIIA VZAIMODEISTVIIA SKHODIASHCHIKHSIA OSESIMMETRICHNYKH UDARNYKH VOLN S OSTRYM I PRITUPLENNYM KONUSAMI V SVERKHZVUKOVOM POTOKE]
A. V. KRASIL'NIKOV Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), Sept.-Oct. 1991, p. 177-182. In Russian. Oct. 1991 6 p In RUSSIAN refs
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Interactions of converging shock waves with sharp and blunt cones were investigated experimentally in a supersonic wind tunnel at a free-stream Mach of 4.67. Details of the experimental procedure and test results are discussed with emphasis on the effect of the taper angle of the converging shock wave, model shape, and its position relative to the shock wave configuration on flow structure and pressure distribution on the model surface. V.L.

A92-14280
FUNDAMENTALS OF APPLIED AEROGASDYNAMICS. I - AERODYNAMICS OF WINGS (PROFILES), AIRFRAMES, AND THEIR COMBINATIONS [OSNOVY PRIKLADNOI AEROGAZODINAMIKI. I - AERODINAMIKA KRYLA /PROFILIA/, KORPUSA I IKH KOMBINATSII]
NIKOLAI F. KRASNOV, EVGENII E. BOROVSKII, and ALEKSANDR I. KHLUPNOV Moscow, Izdatel'stvo Vysshaia Shkola, 1990, 336 p. In Russian. 1990 336 p In RUSSIAN refs
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Analytical and numerical methods for determining the parameters of nonviscous gas flow around bodies are reviewed. Algorithms and computer programs are presented for calculating the aerodynamic derivatives and the drag of isolated wings (profiles), airframes, and their combinations. The aerodynamic characteristics of control surfaces are determined in the general case of steady flow. V.L.

A92-14281
FUNDAMENTALS OF APPLIED AEROGASDYNAMICS. II - VISCOUS FLOW PAST BODIES. CONTROL DEVICES [OSNOVY PRIKLADNOI AEROGAZODINAMIKI. II - OBTEKANIE TEL VIAZKOI ZHIDKOST'IU. RULEVYE USTROISTVA]
NIKOLAI F. KRASNOV, VSEVOLOD N. KOSHEVOI, VADIM F. ZAKHARCHENKO, and ANATOLII N. DANILOV Moscow, Izdatel'stvo Vysshaia Shkola, 1991, 360 p. In Russian. 1991 360 p In RUSSIAN refs
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Analytical and numerical methods are presented for calculating the boundary layer (laminar, turbulent, and mixed), heat transfer, aerodynamic heating, and ablation. Separated and jet flows are analyzed as means of controlling flow around bodies and their aerodynamic characteristics. Data are presented on the automation of an aerodynamic experiment using a computer for data acquisition, processing, and storage. Algorithms and programs are also presented for computing the parameters of viscous gas flow and separated flows and for calculating the design parameters of wind tunnels. V.L.

A92-15034
EQUILIBRIUM OF THE INTERNAL DEGREES OF FREEDOM OF MOLECULES AND ATOMS DURING HYPERSONIC FLIGHTS IN THE UPPER ATMOSPHERE [RAVNOVESNOST' VNUTRENNIKH STEPENEI SVOBODY MOLEKUL I ATOMOV PRI GIPERZVUKOVYKH POLETAKH V VERKHNEI ATMOSFERE]
V. M. DOROSHENKO, N. N. KUDRIAVTSEV, and V. V. SMETANIN (Moskovskii Fiziko-Tekhnicheskii Institut, Moscow, USSR) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 29, Sept.-Oct. 1991, p. 1013-1027. In Russian. Oct. 1991 15 p In RUSSIAN refs
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Data in the literature on the formation and quenching of electronically and vibrationally excited particles in partially dissociated air are reviewed. The principal processes of the formation and annihilation of excited particles are identified which must be taken into account in calculating heat transfer to the surface of spacecraft during descent in the upper atmosphere. Results of a numerical solution for the equation of a thin viscous

shock layer are presented to demonstrate the effect of the formation of excited particles on heat flow toward the surface of a space shuttle. V.L.

A92-15038
SOME PROPERTIES OF SUBSONIC FLOW IN THE WAKE OF A SHOCK WAVE GENERATED IN SUPERSONIC FLOW PAST BODIES OF FINITE THICKNESS [O NEKOTORYKH SVOISTVAKH DOZVUKOVOGO TECHENIIA ZA UDARNOI VOLNOI, VOZNIKAIUSHCHEI PRI SVERKHZVUKOVOM OBTEKANII TEL KONECHNOI TOLSHCHINY]
A. I. RYLOV Prikladnaia Matematika i Mekhanika (ISSN 0032-8235), vol. 55, Sept.-Oct. 1991, p. 780-786. In Russian. Oct. 1991 7 p In RUSSIAN refs
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The paper is concerned with subsonic vortex flow in the wake of a separated or a reattached shock wave formed in plane supersonic flow past symmetrical bodies of finite thickness. In particular, attention is given to the relationship between subsonic regions of the body and the shock wave. It is shown that, when the wall angles are nonnegative, the velocity vector angles behind the shock wave are also nonnegative, and the shock wave angles do not exceed pi/2. Flow past a finite wedge with a bend in the generatrix is also analyzed. V.L.

A92-16679
THREE-DIMENSIONAL SINGULARITY OF FLOW STRUCTURE IN AN UNDEREXPANDED SUPERSONIC JET [TREKHMERNAIA OSOBENNOST' STRUKTURY TECHENIIA V SVERKHZVUKOVOI NEDORASSHIRENNOI STRUE]
V. I. ZAPRIAGAEV and A. V. SOLOTCHIN PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (ISSN 0044-4626), July-Aug. 1991, p. 42-47. In Russian. Aug. 1991 6 p In RUSSIAN refs
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Structural inhomogeneities in underexpanded supersonic jets were investigated experimentally by using the photographic method and by measuring full and static pressures in the flow region between a suspended compression shock and the jet boundary in the compressed layer. The results obtained are found to be consistent with the hypothesis about the existence of formations of the Taylor-Goertler vortex type in the compressed layer of nonisobaric jets. V.L.

A92-16680
CHANGING THE STRUCTURE AND IMPROVING THE AERODYNAMIC CHARACTERISTICS OF SUPERSONIC FLOW PAST BODIES THROUGH EJECTION OF A GAS JET WITH PARTICLES [IZMENENIE STRUKTURY I ULUCHSHENIE AERODINAMICHESKIKH KHARAKTERISTIK SVERKHZVUKOVOGO OBTEKANIIA TEL ZA SCHET VYDUVA IS NIKH STRUI GAZA S CHASTITSAMI]
N. P. GRIDNEV PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (ISSN 0044-4626), July-Aug. 1991, p. 47-50. In Russian. Aug. 1991 4 p In RUSSIAN refs
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Supersonic flow past bodies of revolution (a cone-cylinder configuration and a cylinder) and their aerodynamic characteristics are investigated analytically in the case where a jet of a gas with solid particles is ejected from the surface of the body. The treatment is based on the numerical solution of a full system of Navier-Stokes equations for a viscous heat-conducting gas and employs a third-order difference scheme. Optimal ejection parameters are determined. V.L.

A92-16681
SELF-OSCILLATORY INTERACTION OF AN UNDEREXPANDED JET WITH AN OBSTACLE IN THE PRESENCE OF A SUPERSONIC WAKE [AVTOKOLEBATEL'NYI REZHIM VZAIMODEISTVIIA NEDORASSHIRENNOI STRUI S PREGRADOI PRI NALICHII SVERKHZVUKOVOGO SPUTNOGO POTOKA]
G. F. GORSHKOV, V. N. USKOV, and A. P. USHAKOV PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (ISSN 0044-4626), July-Aug. 1991, p. 50-58. In Russian. Aug. 1991 9 p In RUSSIAN refs
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Experiments were carried out in a supersonic wind tunnel in an effort to gain a better understanding of the mechanisms of the self-oscillatory regime of the interaction between a supersonic jet and a plane obstacle in the presence of a supersonic wake. In the experiments, the self-oscillatory regime of jet-obstacle interaction was observed under conditions where the existence of an acoustic wave feedback was ruled out. Without denying the effect of the external acoustic feedback, it is demonstrated that this feedback is not the principal mechanism of the formation of nonstationary flow in the shock layer. V.L.

A92-16682
FEEDBACK MECHANISM OF SELF-OSCILLATIONS IN THE CASE OF AN UNDEREXPANDED SUPERSONIC JET IMPINGING ON A PLANE OBSTACLE [O MEKHANIZME OBRATNOI SVIAZI V AVTOKOLEBANIIAKH PRI NATEKANII SVERKHZVUKOVOI NEDORASSHIRENNOI STRUI NA PLOSKUIU PREGRADU]
V. N. GLAZNEV PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (ISSN 0044-4626), July-Aug. 1991, p. 59-63. In Russian. Aug. 1991 5 p In RUSSIAN refs
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Self-oscillations excited during the interaction of an underexpanded supersonic jet with a plane obstacle were investigated experimentally using a jet of cold air at Mach 1.5. The results obtained are compared with the results of earlier experimental and theoretical studies. It is argued that, contrary to the conclusion of Gorshkov et al. (1991), the external acoustic feedback is a major factor determining the amplitude-frequency characteristics of the self-oscillations. V.L.

A92-16684
STABILITY OF A VISCOUS COMPRESSIBLE SHEAR LAYER WITH A TEMPERATURE DROP [USTOICHIVOST' VIAZKOGO SZHIMAEMOGO SLOIA SDVIGA S PEREPADOM TEMPERATUR]
A. N. KUDRIAVTSEV and A. S. SOLOV'EV PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (ISSN 0044-4626), July-Aug. 1991, p. 88-95. In Russian. Aug. 1991 8 p In RUSSIAN refs
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The stability of a free shear layer formed as a result of the mixing of two parallel flows of a viscous compressible gas is investigated analytically, with allowance made for the difference in the temperatures of the the mixing flows. The problem is solved by the orthogonalization method using linearized Navier-Stokes equations for a compressible gas. Three unstable modes of discrete spectrum perturbations are identified. Neutral stability curves are presented. V.L.

A92-16812
ANALYSIS OF TRANSONIC FLOW OVER PLANE COMPRESSOR CASCADES USING THE LARGE-PARTICLE METHOD [ANALIZ TRANSZVUKOVOGO OBTEKANIIA PLOSKIKH KOMPRESSORNYKH RESHETOK METODOM KRUPNYKH CHASTITS]
L. G. BOIKO, V. N. ERSHOV, A. E. DEMIN, and D. V. KALIAMIN Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 44-47. In Russian. 1990 4 p In RUSSIAN refs
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The application of the large-particle finite difference method to the calculation of compressible flow in a plane compressor cascade is reported. The statement of the problem and details of the solution procedure are presented. Numerical calculations are made for subcritical and supercritical flow regimes at different angles of attack. V.L.

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I. A. KHALIDOV Leningradskii Universitet, Vestnik, Matematika, Mekhanika, Astronomiia (ISSN 0024-0850), July 1991, p. 88-91. In Russian. Jul. 1991 4 p In RUSSIAN refs
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The difficulties associated with the determination of duty factors from experimental data are briefly reviewed, and an approach to the determination of duty factors for bodies of revolution is proposed which is based on the expansion of the reference function and aerodynamic coefficients into a natural series in Legendre polynomials. A criterion is obtained for selecting the shape of bodies in such a way as to increase the accuracy in determining the duty factors from the specified values of the aerodynamic coefficients of bodies of revolution. V.L.

A92-30126
CONTROL OF THE DEVELOPMENT OF BOUNDARY LAYER DISTURBANCES [UPRAVLENIE RAZVITIEM VOZMUSHCHENII V POGRANICHNOM SLOE]
V. P. ERMOLAEV, IU. V. KIRINOV, V. N. OZEROV, G. P. SVISHCHEV, V. M. FOMIN, and A. A. SHUROV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 1-10. In Russian. 1990 10 p In RUSSIAN refs
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The state of the boundary layer on the wing of the TsAGI airborne laboratory glider and the propagation of disturbances in the form of Tollmien-Schlichting waves in a laminar boundary layer, the development of which results in a transition to the turbulent state, were investigated. It is shown that it is possible to suppress the boundary-layer disturbances by using an acoustic out-of-phase effect to displace the transition boundary to the trailing edge and to extend the laminar-flow region on the wing. I.S.

A92-30127
EXPERIMENTAL INVESTIGATION OF THE COEFFICIENTS OF THE NORMAL-FORCE DERIVATIVES FOR RECTANGULAR WINGS WITH TRANSLATIONAL OSCILLATIONS [EKSPERIMENTAL'NOE ISSLEDOVANIE KOEFFITSIENTOV PROIZVODNYKH NORMAL'NOI SILY PRIAMOUGOL'NYKH KRYL'EV PRI POSTUPATEL'NYKH KOLEBANIIAKH]
G. V. MAKHORTYKH and M. G. SHCHEGLOVA TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 11-20. In Russian. 1990 10 p In RUSSIAN refs
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Results are presented from an experimental determination of the two normal-force coefficients for rectangular wings with aspect ratios of 5 and 3, which move along the chord at a constant speed and which oscillate perpendicularly to the chord. Measurements were conducted in the oscillation facility in the TsAGI test tank. The Strouhal numbers were varied from 0.2 to 4.6 for the wing with an aspect ratio of 5, and from 0.15 to 2.1 for the wing with an aspect ratio of 3. I.S.

A92-30128
COMPUTATIONS OF A TRANSONIC FLOW ABOUT AN AIRFOIL IN A WIND TUNNEL WITH POROUS WALLS [RASCHET OKOLOZVUKOVOGO OBTEKANIIA PROFILIA V TRUBE S PERFORIROVANNYMI STENKAMI]
V. M. NEILAND TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 21-26. In Russian. 1990 6 p In RUSSIAN refs
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Based on the integration technique developed by Neiland (1988) for two-dimensional transonic flows, a method is developed for integrating Euler equations for a flow about an airfoil in a wind tunnel with porous-wall test sections. The salient features of this method include its high speed (which is about 2 orders faster than existing methods) and small RAM capacity required to maintain an adequate calculation capacity. Results of computations for a 10-percent parabolic airfoil are compared with experimental measurements and with computations performed by other methods. I.S.

A92-30129
THE EFFECT OF WING TWIST OPTIMIZED IN THE FRAMEWORK OF THE PLANE CROSS SECTION HYPOTHESIS ON THE AERODYNAMIC CHARACTERISTICS OF A WING-BODY COMBINATION AT HYPERSONIC SPEEDS [VLIIANIE KRUTKI KRYLA, OPTIMIZIROVANNOI V RAMKAKH GIPOTEZY PLOSKIKH SECHENII, NA AERODINAMICHESKIE KHARAKTERISTIKI KOMBINATSII KRYLA S KORPUSOM PRI GIPERZVUKOVYKH SKOROSTIAKH]
IU. I. LOBANOVSKII and M. E. NESTEROV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 27-35. In Russian. 1990 9 p In RUSSIAN refs
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The effect of wing twist on the aerodynamic characteristics of a wing-body combination at hypersonic speeds is investigated. An approximate optimization procedure is proposed for the wing-body surface optimization, which is based on a combination of the numerical solution of Euler equations and the 'strip' technique. Results are presented of calculations of aerodynamic characteristics of the wing-body combinations with different scales of wing twist, together with a comparison with results obtained for a plane wing. It is shown that, due to a wing twist, it is possible to increase the maximum lift/drag ratio of a hypersonic vehicle by Delta K(max) = 0.1-0.2 and to reduce the absolute pitching moment by (0.25-0.40) x 10 exp -2. I.S.

A92-30136
GENERATION OF SEVERAL WAVE PACKETS IN THE BOUNDARY LAYER OF A WING PROFILE [VOZNIKNOVENIE NESKOL'KIKH VOLNOVYKH PAKETOV V POGRANICHNOM SLOE NA PROFILE KRYLA]
B. IU. ZANIN TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 94-97. In Russian. 1990 4 p In RUSSIAN refs
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The paper examines the conditions for the occurrence and development of instability waves (Tollmien-Schlichting waves) in the boundary layer on an upper wing surface. The occurrence of these wave packets under the effect of the acoustic background in a low-turbulence wind tunnel is shown. I.S.

A92-30138
NUMERICAL MODELING OF SELF-OSCILLATIONS FOR A SMALL-ASPECT-RATIO DELTA WING USING MEASUREMENTS OF ROLL MOTION AT LARGE ANGLES OF ATTACK [CHISLENNOE MODELIROVANIE AVTOKOLEBANII TREUGOL'NOGO KRYLA MALOGO UDLINENIIA PO KRENU NA BOL'SHIKH UGLAKH ATAKI]
G. M. SHUMSKII TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 102-106. In Russian. 1990 5 p In RUSSIAN refs
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Amplitude values of a self-oscillating delta wing in a separated flow of an ideal incompressible fluid were computed using simultaneous solutions of the equations of unsteady aerodynamics and dynamics. The results of calculations obtained for the free-oscillation regimes were found to agree well with test data. The characteristics of the damping function were obtained along with the features of its formation in the first oscillation cycle. It is shown that the amplitude of self-oscillations depends on the dimensionless frequency and the moment of inertia of the wing. I.S.

A92-30144
DEVELOPMENT OF A METHOD FOR CALCULATING THE EFFECT OF THE PROPELLER SLIPSTREAM ON TRANSONIC FLOW OVER THE WING [RAZRABOTKA METODA RASCHETA VLIIANIIA STRUI VINTA NA TRANSZVUKOVOE OBTEKANIE KRYLA]
A. V. SMIRNOV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 2, 1990, p. 20-26. In Russian. 1990 7 p In RUSSIAN refs
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A method is presented for calculating transonic flow of an ideal gas over a swept wing of finite span with allowance for the effect of the propeller slipstream. The solution is obtained in the form of a superposition of the shear and three-dimensional potential flows. Examples of calculations of the flow field in the propeller regions and aerodynamic characteristics of the wing are presented. The calculations are shown to be in satisfactory agreement with experimental data. V.L.

A92-30146
FLOW OF A VISCOUS TWISTED FLUID FILM ON THE SURFACE OF A BLUNT BODY IN SUPERSONIC FLOW OF A GAS [TECHENIE VIAZKOI ZAKRUCHENNOI PLENKI ZHIDKOSTI NA POVERKHNOSTI ZATUPLENNOGO TELA V NABEGAIUSHCHEM SVERKHZVUKOVOM POTOKE GAZA]
P. E. BABIKOV, IU. N. ERMAK, and D. V. IANISHEVSKII TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 2, 1990, p. 43-49. In Russian. 1990 7 p In RUSSIAN refs
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The flow of a liquid evaporating film on the surface of a centrifugal nozzle in supersonic flow of a viscous gas is investigated numerically. The principal flow regions are identified, and boundary value problems are formulated. The similarity parameters are presented, and a numerical solution is obtained for the composite problem. V.L.

A92-30154
EFFECT OF VISCOSITY ON THE DRAG OF SLENDER AXISYMMETRIC BODIES IN HYPERSONIC FLOW [VLIIANIE VIAZKOSTI NA SOPROTIVLENIE TONKIKH OSESIMMETRICHNYKH TEL PRI GIPERZVUKOVYKH SKOROSTIAKH OBTEKANIIA]
P. I. GORENBUKH and V. P. PROVOTOROV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 2, 1990, p. 115-117. In Russian. 1990 3 p In RUSSIAN refs
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The effect of viscosity on the drag of sharp and slightly blunt slender axisymmetric bodies in hypersonic flow is investigated analytically. Based on the results of numerical calculations, an approximate expression is obtained for the relative drag coefficient as a function of a modified parameter of viscous interaction. V.L.

A92-30157
A PRESSURE-DRAG-DETERMINATION METHOD FOR AERODYNAMIC-INTERFERENCE PROBLEMS [METOD OPREDELENIIA SOPROTIVLENIIA DAVLENIIA V ZADACHAKH AERODINAMICHESKOI INTERFERENTSII]
L. L. TEPERIN and A. IU. UDZHUKHU TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 3, 1990, p. 3-10. In Russian. 1990 8 p In RUSSIAN refs
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A convenient formula is developed for calculating aerodynamic forces on the surface of a body in a flow without integrating the pressure distribution on the body surface. The efficiency of the formula is demonstrated in several applications to aerodynamic-interference problems. Special consideration is given to the problem of the interaction between an ideal propeller with aircraft elements. I.S.

A92-30159
AN ASYMPTOTIC TRANSONIC THEORY AND OPTIMAL POROSITY OF WIND TUNNEL WALLS AT M GREATER THAN ABOUT 1 [ASIMPTOTICHESKAIA TRANSZVUKOVAIA TEORIIA I OPTIMAL'NAIA PRONITSAEMOST' STENOK AERODINAMICHESKOI TRUBY PRI M GREATER THAN ABOUT 1]
V. M. NEILAND TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 3, 1990, p. 19-27. In Russian. 1990 9 p In RUSSIAN refs
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A novel approach is proposed for deriving equations of the transonic thin-profile theory, which enables the development for constructing any approximation. These algorithms were used to determine the optimal porosity of the porous walls of a wind tunnel at values of M greater than about 1. The theoretical results are compared with experimental data. I.S.

A92-30160
AN EXPERIMENTAL STUDY OF TONE-LIKE NOISE IN THE FLOW PAST A WING AT LOW FLOW VELOCITIES [EKSPERIMENTAL'NOE ISSLEDOVANIE TONAL'NOGO SHUMA OBTEKANIIA KRYLA PRI MALYKH SKOROSTIAKH POTOKA]
A. G. MUNIN, A. G. PROZOROV, and A. V. TOPOROV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 3, 1990, p. 28-38. In Russian. 1990 11 p In RUSSIAN refs
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The causes of the appearance of tone-like noise in the flow past a wing are analyzed. A correlation is found between the tonal components of the noise and the hydrodynamic pulsations in the region of laminar-to-turbulent boundary layer transition and in the aerodynamic wake. Different ways to prevent intense narrow-band hydrodynamic and acoustical disturbances are indicated. It was found that the frequency and the level of the observed disturbances depend on the Reynolds number and the angle of attack. I.S.

A92-30167
THE FEASIBILITY OF REDUCING INDUCED WING DRAG BY USING CRESCENT PLANFORM WINGS [O VOZMOZHNOSTI UMEN'SHENIIA INDUKTIVNOGO SOPROTIVLENIIA KRYLA ZA SCHET PRIDANIIA EMU SERPOVIDNOI FORMY V PLANE]
V. I. BABKIN, E. E. BOBYR', and N. I. ZHELEZNIAK TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 3, 1990, p. 104-108. In Russian. 1990 5 p In RUSSIAN refs
Copyright
The paper analyzes the results of van Dam (1987) suggesting that the crescent planform wings result in a reduction of the induced wing drag, compared with the wind drag induced by elliptical wings. It is shown that the results of present calculations using well-known analytical methods do not support van Dam's conclusion. I.S.

A92-30171
EXPERIMENTAL STUDY OF THE CHARACTERISTICS OF BOUNDARY-LAYER DEVELOPMENT ON AN AIRFOIL [EKSPERIMENTAL'NOE ISSLEDOVANIE OSOBENNOSTEI RAZVITIIA POGRANICHNOGO SLOIA NA PROFILE]
V. D. BOKSER and S. V. ZHIGULEV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 4, 1990, p. 3-10. In Russian. 1990 8 p In RUSSIAN refs
Copyright
The behavior of the surface boundary layer in the tail section of a supercritical profile was investigated using local noncontact velocity measurements in this region. Data are presented on the characteristic boundary-layer thicknesses and form parameters for angles of attack between 0.4 and 3.3 deg, at M = 16 and Re = 1.7 x 10 exp 6. A correlation was carried out between the measured velocity profiles and the integral characteristics of the boundary layer for the experimental profile and the results of appropriate calculations for a flat plate. The magnitude of the surface friction was estimated, and the region of lowest surface friction was identified. Experimental methods for estimating the region of low surface friction on the profile are proposed. I.S.

A92-30172
THE LIFT-DRAG RATIO OF A SLENDER CONE IN VISCOUS HYPERSONIC GAS FLOW [AERODINAMICHESKOE KACHESTVO TONKOGO KONUSA V VIAZKOM GIPERZVUKOVOM POTOKE GAZA]
P. I. GORENBUKH, A. S. KOROLEV, S. E. MOIZIS, and V. I. SHUSTOV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 4, 1990, p. 18-22. In Russian. 1990 5 p In RUSSIAN refs
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Using experimental data and results of calculations, the effects

Mashinostroenie (ISSN 0236-3941), Jan.-Mar. 1991, p. 29-35. In Russian. Mar. 1991 7 p In RUSSIAN refs
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The three-dimensional angular motions of a uniformly rotating axisymmetric flight vehicle characterized by aerodynamic hysteresis are analyzed as a function of the three-dimensional angle of attack. Bifurcation surfaces are constructed which separate the parameter space of the dynamic system considered into regions with qualitatively different regimes of angular motion. The results provide an estimate of the possible motions of rotating flight vehicles with a hysteresis of aerodynamic characteristics in the case of the piecewise linear approximation of the moment. V.L.

A92-30373
AN APPROXIMATE METHOD FOR CALCULATING FLOW PAST SOLID WINGS OF SMALL ASPECT RATIO BASED ON A NONLINEAR THEORY OF A CONTINUOUS VORTEX SURFACE [PRIBLIZHENNYI METOD RASCHETA OBTEKANIIA TELESNYKH KRYL'EV MALOGO UDLINENIIA NA OSNOVE NELINEINOI TEORII NEPRERYVNOI VIKHREVOI POVERKHNOSTI]
A. I. PASTUKHOV and E. K. GALEMIN Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriia Mashinostroenie (ISSN 0236-3941), Jan.-Mar. 1991, p. 55-60. In Russian. Mar. 1991 6 p In RUSSIAN refs
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A method for calculating load distributions over the surfaces of cylindrical bodies of small aspect ratios and their force and moment characteristics is proposed which is based on the nonlinear vortex theory of lifting surfaces. Results of calculations of the wing root pressure coefficient for an angle of attack of 20 deg are presented for the NACA-0018 airfoil. A comparison with experimental data indicates that the method provides satisfactory estimates of distributed aerodynamic characteristics. V.L.

A92-30375
CALCULATION OF THE AERODYNAMIC CHARACTERISTICS OF BODIES OF REVOLUTION IN INCOMPRESSIBLE FLOW BY THE VORTEX SURFACE METHOD [VYCHISLENIE AERODINAMICHESKIKH KHARAKTERISTIK TEL VRASHCHENIIA V NESZHIMAEMOM POTOKE METODOM VIKHREVOI POVERKHNOSTI]
A. I. PASTUKHOV, A. D. DERIABIN, and V. F. VERETENNIKOV Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriia Mashinostroenie (ISSN 0236-3941), Jan.-Mar. 1991, p. 110-116. In Russian. Mar. 1991 7 p In RUSSIAN refs
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An approximate method for calculating the distributed and integral aerodynamic characteristics of bodies of revolution of arbitrary shape is proposed which is based on a nonlinear vortex theory. The method has been developed for separated flows past bodies moving in an incompressible medium at large angles of attack and is intended for use in CAD systems for the design of flight vehicles. V.L.

A92-31492
NUMERICAL SIMULATION OF THREE-DIMENSIONAL SUPERSONIC FLOW AROUND AERODYNAMIC CONFIGURATIONS
P. I. CHUSHKIN (AN SSSR, Vychislitel'nyi Tsentr, Moscow, USSR) and G. P. VOSKRESENSKII (AN SSSR, Institut Prikladnoi Matematiki, Moscow, USSR) (International Association for Computational Mechanics, World Congress of Computational Mechanics, 2nd, Stuttgart, Federal Republic of Germany, Aug. 27-31, 1990) International Journal for Numerical Methods in Engineering (ISSN 0029-5981), vol. 34, March 30, 1992, p. 485-506. 30 Mar. 1992 22 p refs
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The present report deals with many applications of different numerical methods to calculations of three-dimensional stationary supersonic flows around aerodynamic configurations. Both an inviscid non-heat-conducting perfect gas and a real high-temperature gas with physical-chemical processes are considered. The results of some investigations carried out during recent years in the USSR are reviewed. A brief description of applicable numerical methods is presented. A number of results are discussed both for separate parts of a flying vehicle and for whole configurations. Some gasdynamic effects, and aerodynamic and thermal characteristics are analyzed. Among the aerodynamic elements considered are pointed and blunted nose parts of configurations, air intakes, wing, and stabilizers. Also more complicated cases are considered such as compound aerodynamic objects and configurations modeling different kinds of whole flying vehicles (missile, aircraft, spacecraft). Author

A92-31853
OPTIMIZATION OF A LIFTING SURFACE FOR MINIMUM INDUCED DRAG [OPTIMIZATSIIA NESUSHCHEI POVERKHNOSTI PO MINIMUMU INDUKTIVNOGO SOPROTIVLENIIA]
A. N. KOLOBKOV and M. I. NIKOLAEV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 1, 1991, p. 27-31. In Russian. 1991 5 p In RUSSIAN refs
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The lifting surface theory is used to solve the inverse aerodynamic problem of determining the middle surface shape of a wing corresponding to a minimum induced drag. A matrix equation is derived which makes it possible to obtain a solution without representing the aerodynamic load in the form of double Fourier series. Calculation results are presented for a swept wing with a nondeformable section. V.L.

A92-31854
ANALYTICAL AND EXPERIMENTAL STUDIES OF THE AERODYNAMIC CHARACTERISTICS OF A DELTA WING AT A SLIP ANGLE AT HIGH SUPERSONIC VELOCITIES [RASCHETNO-EKSPERIMENTAL'NYE ISSLEDOVANIIA AERODINAMICHESKIKH KHARAKTERISTIK TREUGOL'NOGO KRYLA POD UGLOM SKOL'ZHENIIA PRI BOL'SHIKH SVERKHZVUKOVYKH SKOROSTIAKH]
P. I. GORENBUKH and V. S. NIKOLAEV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 1, 1991, p. 32-38. In Russian. 1991 7 p In RUSSIAN refs
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Analytical expressions are obtained for the coefficients of the aerodynamic forces and moments of a delta wing with cylindrical leading edges and plane lower and upper surfaces consisting of two plane halves. The path stability characteristics and the possibility of slip angle nonlinearity are investigated. An experimental study is made of the lateral moment characteristics of a delta wing with flat leading edges. V.L.

A92-31855
AERODYNAMIC CHARACTERISTICS OF A BLUNT DELTA WING WITH AIR BLEED THROUGH AN INTAKE AT SUPERSONIC AND HYPERSONIC VELOCITIES. II [AERODINAMICHESKIE KHARAKTERISTIKI ZATUPLENNOGO TREUGOL'NOGO KRYLA S OTBOROM VOZDUKHA CHEREZ VOZDUKHOZABORNIK PRI SVERKH- I GIPERZVUKOVYKH SKOROSTIAKH. II]
S. A. BAKHAREV, V. G. GURYLEV, and A. P. KOSYKH TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 1, 1991, p. 39-47. In Russian. 1991 9 p In RUSSIAN refs
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Results of numerical calculations of aerodynamic characteristics are reported for a blunt-leading-edge 81-degree-sweep delta wing with air bleed through an intake on the upwind side at supersonic and hypersonic velocities (M = 2-20), without any allowance made for viscosity and changes in the thermodynamic properties of the air. The effect of the high-entropy layer and air bleed on the air flow rate and drag coefficients, lift force, and lift-drag ratio of the wing is examined. V.L.

A92-31857
SINGULARITY BYPASS ALGORITHMS IN THE NUMERICAL SOLUTION OF EQUATIONS OF BODY MOTION RELATIVE TO A CENTER OF MASS IN THE ATMOSPHERE IN THE PRESENCE OF DISTURBANCES [ALGORITMY OBKHODA OSOBENNOSTI PRI CHISLENNOM RESHENII URAVNENII DVIZHENIIA TEL OTNOSITEL'NO TSENTRA MASS V ATMOSFERE PRI DEISTVII VOZMUSHCHENII]
G. M. LOKHOV and S. I. PODZOROV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 1, 1991, p. 54-60. In Russian. 1991 7 p In RUSSIAN refs
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An efficient algorithm for bypassing the singularity in kinematic equations is proposed which can be used in the numerical solution of the equations using fast combined methods for studying the three-dimensional motion of rigid bodies around a center of mass in the atmosphere in the presence of disturbances. Based on a system of equations using the Rodrigues-Hamilton parameters as kinematic variables and therefore containing no singularities, an algorithm is proposed for the conversion of the relative motion parameters from the quaternion representation to angles of attack and bank and vice versa. V.L.

A92-31860
A PARAMETRIC STUDY OF THE LIFT-DRAG RATIO OF BLUNT CONES [PARAMETRICHESKOE ISSLEDOVANIE AERODINAMICHESKOGO KACHESTVA ZATUPLENNYKH KONUSOV]
G. G. VORONOVA, A. V. LIMANSKII, and V. I. TIMOSHENKO TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 1, 1991, p. 77-81. In Russian. 1991 5 p In RUSSIAN refs
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Results of a parametric study of the dependence of the lift-drag ratio of blunt cones on the principal geometric and physical parameters are reported. The results were obtained by solving the supersonic flow problem in the nonviscous and viscous gas approximations. Expressions are derived which relate the lift-drag ratio and the additional viscous terms to the aspect ratio and the half-angle of taper. V.L.

A92-31861
A SUPPLEMENT TO THE SECOND-ORDER SHOCK-EXPANSION METHOD [DOPOLNENIE K METODU SKACHKOV - RASSHIRENII VTOROGO PORIADKA TOCHNOSTI]
A. I. SARANTSEV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 1, 1991, p. 82-88. In Russian. 1991 7 p In RUSSIAN refs
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The shock-expansion method is simplified by using different functions for pressure approximation. As a result, the method can be used in applications where its use has been associated with certain difficulties. The new functions contain a free parameter which affects the accuracy of the calculations. Although this parameter has not been determined exactly, the use of certain assumptions about its value makes it possible to achieve satisfactory accuracy. V.L.

A92-31862
A HEAT FLOW PEAK ON THE UPWIND SURFACE OF A BLUNT-LEADING-EDGE DELTA WING [PIK TEPLOVOGO POTOKA NA NAVETRENNOI STORONE TREUGOL'NOGO KRYLA S ZATUPLENNYMI PEREDNIMI KROMKAMI]
I. A. KONDRAT'EV and A. IA. IUSHIN TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 1, 1991, p. 89-92. In Russian. 1991 4 p In RUSSIAN refs
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Results of an experimental study of heat transfer on the upwind side of a blunt-leading-edge delta wing are reported for a free-stream Mach of 5. It is shown that, at small angles of attack (less than 5 deg), the bluntness of the leading edge leads to a local increase in the heat transfer coefficient near the line of symmetry of the wing. It is believed that the increase results from the effect of entropic layer absorption by the laminar boundary layer. V.L.

A92-31863
POSSIBILITY OF REDUCING THE WAVE DRAG OF A HYPERSONIC FLIGHT VEHICLE (WAVE RIDER) [VOZMOZHNOSTI UMEN'SHENIIA VOLNOVOGO SOPROTIVLENIIA GIPERZVUKOVOGO LETATEL'NOGO APPARATA /VOLNOLETA/]
G. I. MAIKAPAR TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 1, 1991, p. 93-100. In Russian. 1991 8 p In RUSSIAN refs
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The lift-drag ratio is calculated for a specific lift force prescribed on a surface of gas flow behind plane shocks which may represent fragments of a flight vehicle surface. The effects of the leading edge sweep, longitudinal profile, and interference of vehicle components is considered. Prospects for reducing the wave drag are discussed. V.L.

A92-31867
SUBSONIC FLOW PAST A THIN AIRFOIL IN A CHANNEL WITH POROUS WALLS [DOZVUKOVOE OBTEKANIE TONKOGO PROFILIA V KANALE S PERFORIROVANNYMI STENKAMI]
S. A. GLAZKOV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 2, 1991, p. 3-12. In Russian. 1991 10 p In RUSSIAN refs
Copyright
A solution to the problem of ideal incompressible flow past an airfoil is obtained for a channel whose upper and lower walls can have different porosities depending on the direction of gas flow. Calculations are made of the pressure coefficient distributions over the channel walls and the airfoil, located at a certain angle of attack along the symmetry axis of the channel. L.M.

A92-31868
FLOW PAST A HIGHLY CURVED WING WITH TANGENTIAL JET EJECTION [OBTEKANIE KRYLA BOL'SHOI KRIVIZNY S TANGENTSIAL'NYM VYDUVOM STRUI]
A. V. PETROV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 2, 1991, p. 13-22. In Russian. 1991 10 p In RUSSIAN refs
Copyright
Experimental and calculated total and distributed aerodynamic characteristics are presented for a rectangular wing with a profile of high relative curvature average (f-max = 30 percent) when the jet is ejected from a slotted nozzle tangentially to its upper surface. The effect of the jet ejection from one or several nozzles on the lift coefficient and wing pressure distribution is shown when the jet momentum coefficient is varied from 0 to 0.7 and the wing angle of attack is varied from -10 to 30 deg. L.M.

A92-31869
INTERACTION OF JETS EJECTED FROM TWO-DIMENSIONAL NOZZLES WITH A CURVED SURFACE [VZAIMODEISTVIE STRUI, VYDUVAEMYKH IZ PLOSKIKH SOPL, S KRIVOLINEINOI POVERKHNOST'IU]
N. M. MITROKHIN and A. V. PETROV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 2, 1991, p. 23-30. In Russian. 1991 8 p In RUSSIAN refs
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Characteristics of the interaction of jets ejected from 2D and slotted nozzles with a cylindrical surface were investigated experimentally. The effects of excess nozzle exit pressure, nozzle extension, and relative distance between the nozzles and the cylindrical surface on the jet deflection angle are shown. Attention is given to the possibility of improving the jet deflection by eliminating the gap between the nozzle and the surface in the flow, by mounting walls near the lateral boundaries of the jet, and the ejection of additional control jets. L.M.

A92-31899
STRUCTURE OF A BOUNDARY LAYER ON THE LOWER SURFACE OF A WING IN FLIGHT AND IN A WIND TUNNEL [STRUKTURA POGRANICHNOGO SLOIA NA NIZHNEI POVERKHNOSTI KRYLA V POLETE I V AERODINAMICHESKOI TRUBE]
B. IU. ZANIN TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 3, 1991, p. 118-122. In Russian. 1991 5 p In RUSSIAN refs
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Results of experimental studies of the structure of the boundary layer on the lower wing surface conducted on a glider and in a wind tunnel are reported. It is found that flow over the windward side of the wing leads to the laminar-turbulent transition in the boundary layer despite the increased static pressure. The mechanism of the transition is similar to that observed earlier on the upper downwind side of the wing. V.L.

A92-31962
AN EXACT SOLUTION TO EDGE EFFECT PROBLEM FOR A FINITE-SPAN WING IN SUPERSONIC FLOW [OB ODNOM TOCHNOM RESHENII ZADACHI O KONTSEVOM EFFEKTE KRYLA KONECHNOGO RAZMAKHA V SVERKHZVUKOVOM POTOKE]
N. F. VOROB'EV PMTF - Prikladnaia Mekhanika i Tekhnicheskaia Fizika (ISSN 0044-4626), Jan.-Feb. 1992, p. 65-70. In Russian. Feb. 1992 6 p In RUSSIAN refs
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Formulas are presented for calculating the gasdynamic parameters of flow in the case where the velocity potential is determined in terms of the first and second derivatives in the basis plane. The solution proposed here provides for shedding at subsonic edges, which corresponds to separated flow over a finite-span wing. V.L.

A92-31963
BOUNDARY LAYER ON SLENDER WINGS OF SMALL ASPECT RATIO [POGRANICHNYI SLOI NA TONKIKH KRYL'IAKH MALOGO UDLINENIIA]
V. I. SHALAEV PMTF - Prikladnaia Mekhanika i Tekhnicheskaia Fizika (ISSN 0044-4626), Jan.-Feb. 1992, p. 71-78. In Russian. Feb. 1992 8 p In RUSSIAN refs
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Equations of flow over slender wings of small aspect ratio at high Reynolds numbers are analyzed asymptotically. A regular solution to the problem of nonvortex flow is obtained which is accurate to within values that are linear with respect to small parameters (angle of attack and wing thickness). It is shown that in this case the three-dimensional boundary value problem is reduced to that of solving a set of two-dimensional problems. Results of calculations of laminar and turbulent boundary layers on a delta wing are presented and compared with experimental data. V.L.

A92-36420
STRUCTURE OF THE SEPARATED FLOW REGION IN A DIHEDRAL CORNER IN FRONT OF AN OBSTACLE IN SUPERSONIC FLOW [STRUKTURA OBLASTI OTRYVNOGO TECHENIIA V DVUGRANNOM UGLE PERED PREPIATSTVIEM, OBTEKAEMYM SVERKHZVUKOVYM POTOKOM]
A. I. ZUBKOV, B. E. LIAGUSHIN, and IU. A. PANOV Moskovskii Universitet, Vestnik, Seriia 1 - Matematika, Mekhanika (ISSN 0579-9368), no. 1, Jan.-Feb. 1992, p. 107-110. In Russian. Feb. 1992 4 p In RUSSIAN refs
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The paper is concerned with supersonic flow past an obstacle located at an inner side of a dihedral corner. In particular, wind tunnel test results are presented for a model in the form of a 90-deg dihedral angle formed by two tapered 170x300-mm plates, with a cylindrical obstacle introduced through a hole in one of the plates. The structure and size of the separated flow region are determined. V.L.

A92-36549
DETERMINATION OF PHYSICOCHEMICAL CONSTANT IN THE WAKE OF A BODY FROM BALLISTIC EXPERIMENTS [OPREDELENIE FIZIKO-KHIMICHESKIKH KONSTANT V POTOKE ZA TELOM IZ BALLISTICHESKIKH EKSPERIMENTOV]
N. N. BAULIN, E. V. ERMAKOVA, and N. N. PILIUGIN (Moskovskii Gosudarstvennyi Universitet, Moscow, Russia) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 30, no. 2, Mar.-Apr. 1992, p. 299-310. In Russian. Apr. 1992 12 p In RUSSIAN refs
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Experimental data on electron concentration in the wake of a body are processed by solving linearized equations of a chemically nonequilibrium boundary layer describing laminar axisymmetric flow in the wake of a body traveling at a hypersonic velocity. Analytical expressions for the distribution of integral quantities related to electron concentration are obtained and used to determine the constants from electron concentration data using the least squares method. The obtained constants determine the initial wake diameter, temperature distribution along the axis, electron recombination rate, and the Schmidt number. V.L.

A92-36550
VIBRATIONAL RELAXATION EFFECTS IN HYPERSONIC FLOWS OF A VISCOUS GAS [EFFEKTY KOLEBATEL'NOI RELAKSATSII V GIPERZVUKOVYKH TECHENIIAKH VIAZKOGO GAZA]
V. G. SHCHERBAK (Moskovskii Gosudarstvennyi Universitet, Moscow, Russia) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 30, no. 2, Mar.-Apr. 1992, p. 319-324. In Russian. Apr. 1992 6 p In RUSSIAN refs
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Hypersonic flow past a body reentering the earth atmosphere along a gliding path is investigated analytically. Calculations of thermal fluxes are compared with surface temperature determinations based on different approximations of the relaxation time of VV-prime processes. The source terms in the vibrational relaxation equations are estimated, and the need for considering the inverse effect of chemical reactions on the vibrational energy balance is demonstrated. V.L.

A92-36600
SEPARATED AND CAVITATION FLOWS - PRINCIPAL PROPERTIES AND COMPUTATIONAL MODELS [OTRYVNYE I KAVITATSIONNYE TECHENIIA - OSNOVNYE SVOISTVA I RASCHETNYE MODELI]
LEV V. GOGISH (Tsentral'nyi Nauchno-Issledovatel'skii Institut Aviatsionnogo Motorostroeniia, Moscow, Russia) and GEORGII IU. STEPANOV (Moskovskii Gosudarstvennyi Universitet, Moscow, Russia) Moscow, Izdatel'stvo Nauka, 1990, 384 p. In Russian. 1990 384 p In RUSSIAN refs
(ISBN 5-02-014005-8) Copyright
The current concepts of separated flows of a viscous gas or a liquid past bodies involving turbulence and cavitation are examined. The fundamental properties of separated and cavitation flows are described, and methods for correlating experimental data are discussed. Schemes are presented for calculating two-dimensional (plane and axisymmetric) separated flows past bodies over wide ranges of M and Re numbers and cavitation conditions. The discussion also covers a viscous-nonviscous interaction model for cavitation and separation calculations, a model of jet flows and periodic wakes, body drag, and internal separated flows in ducts. V.L.

A92-40602
DESIGN OF WING PROFILES WITH TANGENTIAL SUCTION OR INJECTION [POSTROENIE KRYLOVYKH PROFILEI S TANGENTSIAL'NYM OTSOSOM ILI VDUVOM]
E. IU. ARISTOVA and A. V. POTASHEV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1991, p. 8-11. In Russian. 1991 4 p In RUSSIAN refs
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The problem of the design of a wing profile with tangential suction or injection is considered in the case where the sink (for suction) or the source (for injection) is located at a corner point in a slot at the airfoil surface. Velocity distribution in the neighborhood of the singular point is specified in analytical form. Examples of profiles generated during the numerical implementation of the solution on a computer are presented. V.L.

A92-40605
QUICK CALCULATION OF THREE-DIMENSIONAL SUPERSONIC FLOW PAST NEARLY AXISYMMETRIC BODIES [OPERATIVNYI RASCHET PROSTRANSTVENNOGO SVERKHZVUKOVOGO OBTEKANIIA TEL, BLIZKIKH K OSESIMMETRICHNYM]
V. I. TIMOSHENKO and V. P. GALINSKII Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1991, p. 22-27. In Russian. 1991 6 p In RUSSIAN refs
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Results of calculations of three-dimensional supersonic flow past nearly axisymmetric bodies are presented to demonstrate the advantages of using a trigonometric approximation of the circumferential derivatives over the traditional finite difference methods. The computation times for the two approaches are compared in relation to meridional planes used in the calculation. It is shown that the approach proposed here makes it possible to significantly reduce the number of planes required and thus reduce the computation time by a factor of 5-6 for angles of attack less than 2 deg and by a factor of 3 for angles of attack 2-5 deg in comparsion with the finite difference method in the specific examples considered. V.L.

A92-40746
CALCULATION OF ROTATIONAL DERIVATIVES IN THE CASE OF LOCAL INTERACTION BETWEEN FLOW AND A BODY SURFACE [O RASCHETE VRASHCHATEL'NYKH PROIZVODNYKH PRI 'LOKAL'NOM' VZAIMODEISTVII POTOKA S POVERKHNOST'IU TELA]
A. I. BUNIMOVICH and A. V. DUBINSKII Prikladnaia Matematika i Mekhanika (ISSN 0032-8235), vol. 56, no. 1, Jan.-Feb. 1992, p. 52-57. In Russian. Feb. 1992 6 p In RUSSIAN refs
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The problem of calculating the rotational derivatives of the force and moment characteristics of bodies of revolution moving at angle of attack is analyzed for the case of a low angular velocity. For a general class of models of local interaction between flow and a body surface, formulas are obtained for calculating the second-order rotational derivatives. V.L.

A92-42682
A METHOD FOR DETERMINING THE INTERNAL FORCE CHARACTERISTICS OF A MODEL IN EXTERNAL SUPERSONIC FLOW [METOD OPREDELENIIA VNUTRENNIKH SILOVYKH KHARAKTERISTIK MODELI V USLOVIIAKH OBDUVA EE VNESHNIM SVERKHZVUKOVYM POTOKOM]
A. V. LOKOTKO (Rossiiskaia Akadimiia Nauk, Institut Teoreticheskoi i Prikladnoi Mekhaniki, Novosibirsk, Russia) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0869-1339), no. 1, Jan.-Feb. 1992, p. 53-60. In Russian. Feb. 1992 8 p In RUSSIAN refs
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A method for determining the internal force characteristics (e.g., thrust, lift force, and moment) of a nozzle in external supersonic flow is proposed which is based on the well-known doubling approach. The internal thrust of the model is determined from two consecutive measurements of the weight characteristics, with and without thrust, and calculation of the difference of the two measurements. The model used in such tests is a full configuration where the nozzle is an integral part of the model and is not weighed separately. A wind tunnel implementation of the method is described, and test results obtained for a supersonic passenger aircraft model are presented. V.L.

A92-42683
AERODYNAMICS OF TWO-SHOCK BODIES DERIVED BY THE GASDYNAMIC DESIGN METHOD [AERODINAMIKA DVUKHSKACHKOVYKH TEL, POSTROENNYKH METODOM GAZODINAMICHESKOGO KONSTRUIROVANIIA]
I. I. MAZHUL' and I. I. IAKOVLEV (Rossiiskaia Akademiia Nauk, Institut Teoreticheskoi i Prikladnoi Mekhaniki, Novosibirsk, Russia) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0869-1339), no. 1, Jan.-Feb. 1992, p. 61-65. In Russian. Feb. 1992 5 p In RUSSIAN refs
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Results of a comparative aerodynamic analysis are presented for several configurations constructed by the gasdynamic design method using samples of supersonic plane flows for air intakes of hypersonic flight vehicles. The configurations considered include a plane two-shock air intake, a two-shock V-shaped wing, and two-shock convergent air intakes based on a spatial combination of elementary V-shaped wings. The results obtained in the Mach number range 4-15 suggest that configurations of this kind are characterized by a nonmonotonic dependence of the drag coefficient, an increase of the drag coefficient with the free-stream Mach number, and absence of stabilization with respect to free-stream Mach. V.L.

A92-42684
A STUDY OF AEROPHYSICAL AND DYNAMIC CHARACTERISTICS USING AN AXISYMMETRIC FLIGHT TEST VEHICLE WITH A REUSABLE NOSE SECTION [ISSLEDOVANIE AEROFIZICHESKIKH I DINAMICHESKIKH KHARAKTERISTIK NA LETNOM OSESIMMETRICHNOM KOMPLEKSE S GOLOVNOI CHAST'IU MNOGORAZOVOGO ISPOL'ZOVANIIA]
A. M. PAVLIUCHENKO (Rossiiskaia Akademiia Nauk, Institut Teoreticheskoi i Prikladnoi Mekhaniki, Novosibirsk, Russia) and O. A. BRAGIN (Novosibirskii Gosudarstvennyi Universitet, Novosibirsk, Russia) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0869-1339), no. 1, Jan.-Feb. 1992, p. 66-76. In Russian. Feb. 1992 11 p In RUSSIAN refs
Copyright

Results of a program of aerophysical flight experiments using an M 100 meteorological rocket with a recoverable nose section equipped with electronic measuring and telemetry systems are reported. The program included measurement of temperature profiles in a compressible turbulent boundary layer at the cylindrical part of the nose section under conditions of aerodynamic heating and operating solid-propellant rocket engines; measurement of the amplitude-frequency characteristics of pressure fluctuations at the nose section during the launch of the rocket at Mach less than 0.1; and measurements of the longitudinal and transverse acceleration loads. One of the objectives of the program was also to develop a method for measuring the angle of attack in flight using a Hall transducer. V.L.

A92-42726
CONSTRUCTION OF A WING PROFILE WITH A FLAP MODELED BY A POINT VORTEX [POSTROENIE KRYLOVOGO PROFILIA S ZAKRYLKOM, MODELIRUEMYM TOCHECHNYM VIKHREM]
N. B. IL'INSKII and A. V. POTASHEV Rossiiskaia Akademiia Nauk, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), no. 1, Jan.-Feb. 1992, p. 3-9. In Russian. Feb. 1992 7 p In RUSSIAN refs
Copyright

The method of quasi-solutions of inverse boundary value problems is used to solve the problem of constructing an airfoil with a flap, modeled by a fixed vortex, from a specified velocity distribution over the main area of the wing profile. The method is demonstrated for several specific wing profiles. The effect of the flap (vortex) on the shape and aerodynamic properties of a high-lift wing is discussed. V.L.

A92-52752
INFLUENCE OF INTERNAL MOLECULAR DEGREES OF FREEDOM ON THE HYPERSONIC RAREFIED GAS FLOW ABOUT A CONICAL BODY
I. N. LARINA and V. A. RYKOV (Russian Academy of Sciences, Computing Center, Moscow, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 7 p refs
Copyright
The numerical method for calculating a hypersonic 3D flow past a cold conical body is proposed. The method is based on the solution of model kinetic equations. To study the flow of the diatomic gas the kinetic model equations with regard for rotation DOF are used. Author

A92-52754
APPROXIMATE AERODYNAMIC ANALYSIS FOR COMPLICATED BODIES IN RAREFIED GAS FLOWS
V. D. PERMINOV, S. L. GORELOV, O. G. FRIDLENDER, and A. A. KHMEL'NITSKII (Central Aero-Hydrodynamics Institute, Zhukovski, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 8 p refs
Copyright
In this paper the old and new numerical methods of aerodynamical coefficients determination in free molecular hypersonic flow are reviewed. Based on correlation of available numerical and experimental data the procedures for estimating drag, lift and pitch moment coefficients of three-dimensional bodies in the hypersonic transitional flow regime are presented. Author

A92-52767
AERODYNAMICS OF COMPLEX SHAPE BODIES WITHIN A WIDE RANGE OF SUPERSONIC FLOWS OF RAREFIED GASES
M. S. IVANOV (Russian Academy of Sciences, Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia), V. M. KOTOV, A. N. KRYLOV, A. G. RESHETIN, and A. M. SHELKONOGOV (NPO Energiia, Kaliningrad, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 6 p refs
Copyright
Computational results are presented of spacecraft and space station of a complex shape obtained by the approximate 'local interaction' method and the direct simulation Monte Carlo method within a wide range of flight heights. The comparison of computational data with flight experiment is made. Author

A92-52818
AERODYNAMIC CHARACTERISTICS OF A STANDARD CORRUGATED BODY IN A FREE-MOLECULAR FLOW
IU. A. RYZHOV, S. B. SVIRCHEVSKII, K. N. KUZOVKIN, and A. V. ATAMANENKO (Moscow Aviation Institute, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 8 p refs
Copyright
New numerical and experimental results are presented for aerodynamic characteristics of bodies wit conical cavities of periodic structure. A comparison analysis is made for test-bodies to measure the velocity head of a molecular flow. Author

A92-53867
INTERACTION BETWEEN A BODY FLYING AT A SUPERSONIC VELOCITY AND A POINT EXPLOSION [VZAIMODEISTVIE LETIASHCHEGO SO SVERKHZVUKOVOI SKOROST'IU TELA S TOCHECHNYM VZRYVOM]
V. P. GOLOVIZNIN and I. V. KRASOVSKAIA (Rossiiskaia Akademiia Nauk, Fiziko-Tekhnicheskii Institut, St. Petersburg, Russia) Zhurnal Tekhnicheskoi Fiziki (ISSN 0044-4642), vol. 61, no. 12, Dec. 1991, p. 12-16. In Russian. Dec. 1991 5 p In RUSSIAN refs
Copyright
The problem of the interaction of a blunt body traveling at a supersonic velocity and a spherical detonation wave is investigated using numerical modeling. Attention is given to the evolution of flow near the body, and data are obtained on changes in the structure of the shock layer as a function of the gasdynamic parameters of the detonation wave. It is shown, in particular, that the front of the head shock extends forward as the body penetrates the point explosion zone, and the shock wave degenerates into a Mach wave. V.L.

A92-53882
PULSATION CHARACTERISTICS OF ONE-PHASE AND TWO-PHASE STEAM FLOWS IN LAVAL NOZZLES UNDER OFF-DESIGN CONDITIONS [PUL'SATSIONNYE KHARAKTERISTIKI ODNOFAZNOGO I DVUKHFAZNOGO POTOKOV PARA V SOPLAKH LAVALIA NA NERASCHETNYKH REZHIMAKH]
M. E. DEICH, M. IU. OSHCHEPKOV, A. A. TISHCHENKO, and SH. KH. AL'-DZHANABI Rossiiskaia Akademiia Nauk, Izvestiia, Energetika (ISSN 0002-3310), no. 2, Mar.-Apr. 1992, p. 104-128. In Russian. Apr. 1992 25 p In RUSSIAN refs
Copyright
A study is made of transonic flow of superheated saturated and wet steam in four plane Laval nozzles with different profiles of the subsonic and supersonic sections. The results confirm the effect of wall turbulence decay in the critical section of the nozzle. It is shown that the use of an extended subsonic section makes it possible to achieve flow laminarization up to an initial humidity of 12 percent. It is also shown that the longitudinal gradient in the supersonic nozzle section has a substantial effect on pressure pulsations excited by the interaction between stationary condensation and adiabatic discontinuities with the boundary layer. V.L.

A92-53998
AERODYNAMIC AIRFOILS DESIGN BY QUASI-SOLUTIONS METHOD OF INVERSE BOUNDARY-VALUE PROBLEMS
A. M. ELIZAROV, N. B. IL'INSKII, and A. V. POTASHEV (Kazan State University, Russia) Advances in Mechanics - Uspekhi Mekhaniki (ISSN 0137-3722), vol. 14, no. 2, 1991, p. 49-91. 1991 43 p refs
Copyright
This report presents and reviews new results on the solution of inverse boundary value problems (IBVP) of aerodynamic/hydrodynamics. The principal point of those problems is the determination of the shape of an airfoil, either isolated or as an element of a cascade, when a pressure or velocity distribution providing reasonable velocity aerodynamic/hydrodynamic characteristics of the airfoil surface is given. A major part of the studies involving the IBVP solution is based on the ideal incompressible liquid model. R.E.P.

A92-55395#
STATE-SPACE REPRESENTATION OF AERODYNAMIC CHARACTERISTICS OF AN AIRCRAFT AT HIGH ANGELS OF ATTACK
M. GOMAN and A. KHRABROV (Central Aerohydrodynamic Institute, Moscow, Russia) IN: AIAA Atmospheric Flight Mechanics Conference, Hilton Head Island, SC, Aug. 10-12, 1992, Technical Papers. Pt. 2 1992 8 p refs
(AIAA PAPER 92-4651) Copyright
A state-variable concept is presented which is aimed at deriving a concise but conprehensive description of unsteady and nonlinear aerodynamic behavior of an aircraft. A mathematical model is proposed which is based on internal dynamical variables of the state of separated and vortex flow around the aircraft. The model describes different unsteady effects which have been observed in experiment, including the dependence of aerodynamic characteristics on motion prehistory and the influence of reduced frequency and oscillation amplitude on unsteady aerodynamic derivatives. O.G.

A92-56349
AERODYNAMIC FEATURES OF A COAXIAL ROTOR HELICOPTER

V. A. ANIKIN (Kamov Helicopter Scientific and Technology Co., Russia) European Rotorcraft Forum, 17th, Berlin, Germany, Sept. 24-26, 1991, Paper. 19 p. Sep. 1991 19 p refs

The aerodynamic features of coaxial helicopter components are discussed. The influence of the induced interaction of the rotors on the rotor system aerodynamics in hover and forward flight is shown and compared with the equivalent single rotor characteristics. The effect of the coaxial rotors' aerodynamics symmetry on the helicopter vibration and trim characteristics is addressed. The coaxial rotor aerodynamic features in the gliding mode and the unsteady flapping characteristics of a blade are described. Coaxial-type helicopter fuselage layout features are presented. Numerical simulation problems of coaxial helicopter aerodynamics and its elements are discussed. C.A.B.

A92-57499
INCREASING THE ACCURACY OF THE GODUNOV SCHEME FOR CALCULATING STEADY-STATE SUPERSONIC GAS FLOWS BY SOLVING THE GENERALIZED RIEMANN PROBLEM [POVYSHENIE TOCHNOSTI SKHEMY GODUNOVA DLIA RASCHETA STATSIONARNYKH SVERKHZVUKOVYKH TECHENII GAZA NA OSNOVE RESHENIIA OBOBSHCHENNOI ZADACHI RIMANA]

I. S. MEN'SHOV Zhurnal Vychislitel'noi Matematiki i Matematicheskoi Fiziki (ISSN 0044-4669), vol. 32, no. 2, Feb. 1992, p. 311-319. In Russian. Feb. 1992 9 p In RUSSIAN refs
Copyright

The classical self-similar problem of interaction between two homogeneous steady-state supersonic gas flow is extended to inhomogeneous flows, i.e., to the case of an arbitrary variable distribution of the gasdynamic parameters. An explicit analytical solution is obtained in the vicinity of the flow-mixing line. This solution is then used to improve the accuracy of the Godunov scheme for calculating steady-state supersonic gas flows. V.L.

N92-15964# Royal Aircraft Establishment, Farnborough (England).
THE EFFECT OF ROUNDING THE LEADING EDGES ON THE CHARACTERISTICS OF SEPARATED FLOW PAST DELTA WINGS OF LOW ASPECT RATIO

S. B. ZAKHAROV Nov. 1990 15 p Transl. into ENGLISH from TsAGI Uchenye Zapiski, (Moscow, USSR) v. 13, no. 4, 1982 p 1-9 Original language document was announced in IAA as A83-37551
(RAE-LIB-TRANS-2164; BR305194; AD-A242212) Copyright
Avail: CASI HC A03/MF A01

The elongated-body approximation is used to analyze the separated flow of an ideal fluid past delta wings of low aspect ratio with blunt leading edges. The numerical method used is based on a mathematical model of inviscid separation with a smooth surface. Calculations are performed of symmetric flow around wings whose traverse cross sections are ellipses of small relative thickness. An analysis is presented of the effects of the location of the separation line, the blunting of the edges, and wing thickness on the configuration of the vortex sheet and the overall aerodynamic characteristics of the wing. Author

03

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

N92-34081# National Transportation Safety Board, Washington, DC.
AIRCRAFT ACCIDENT/INCIDENT SUMMARY REPORT: CONTROLLED FLIGHT INTO TERRAIN BRUNO'S INC., BEECHJET, N25BR, ROME, GEORGIA, 11 DECEMBER 1991

8 Jul. 1992 32 p
(PB92-910404; NTSB/AAR-92/01/SUM) Avail: CASI HC A03/MF A01

The crash of N25BR into mountainous terrain near Rome, Georgia is explained. The safety issues discussed include the policies and procedures in corporate flight operations, the role of the first officer in corporate flight operations, and the use of ground proximity warning systems in FAR Part 91 operations of turbojet-powered airplanes. Author

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

A92-21683
PROCESSING AND DISPLAYING RADIO NAVIGATION DATA [OBRABOTKA I OTOBRAZHENIE RADIONAVIGATSIONNOI INFORMATSII]

LEONID S. BELIAEVSKII, VLADIMIR S. NOVIKOV, and PETR V. OLIANIUK Moscow, Izdatel'stvo Radio i Sviaz', 1990, 232 p. In Russian. 1990 232 p In RUSSIAN refs
Copyright

State-of-the-art methods of processing and displaying radio navigation data and the principal data processing algorithms used in radio navigation systems are reviewed. Topics discussed include the selection and grouping of information parameters in radio navigation systems; spatial-temporal processing of radio navigation data; multiprocessor computer systems for solving navigation problems; and monitoring of the technical condition of radio navigation systems. Consideration is also given to the psychological aspects of data perception and navigation data display systems. V.L.

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

A92-14455
MAIN CONCEPTS OF PROVIDING THE STATIC/FATIGUE STRENGTH OF HELICOPTERS IN THE USSR

A. F. SELIKHOV (Tsentral'nyi Aerogidrodinamicheskii Institut, Zhukovsky, USSR) AHS, Annual Forum, 47th, Phoenix, AZ, May 6-8, 1991, Paper. 33 p. May 1991 33 p refs

Procedures adopted in the USSR for ensuring the static/fatigue strength of the primary structures of helicopters are briefly reviewed. The discussion covers provisions for extending the flight vehicle life cycle, design requirements, procedures for testing experimental and commercial helicopters, and safety margins that are applied to flight test results. Attention is also given to feedback mechanisms incorporated into the existing system of static/fatigue strength assurance. V.L.

A92-16064
MIG-29 PROTOTYPE AND DEVELOPMENT FLIGHT TESTS - GENERAL OVERVIEW AND HIGH ANGLE OF ATTACK INVESTIGATION

VALERII E. MENITSKII (Mikoyan Design Bureau, USSR) IN: 1990 report to the aerospace profession; Society of Experimental Test Pilots, Symposium, 34th, Beverly Hills, CA, Sept. 27-29, 1990, Proceedings 1990 4 p
Copyright

A flight test program history is presented for the MiG-29 prototypes, which began in October, 1977. The program proceeded on the bases of the results from computer models, simulator investigations based on modeling results, the test of free-flight models, wind tunnel tests, and spin-recovery capability tests. Attention is given to the behavior encountered during MiG-29 spin behavior and high angle-of-attack testing, by comparison with the MiG-23. O.C.

A92-16802
MAXIMUM MASS ALLOWANCE TO JUSTIFY PASSENGER-CARRYING AIRCRAFT MODIFICATION [PREDEL'NYE IZDERZHKI MASSY, OBESPECHIVAIUSHCHIE TSELESOOBRAZNOST' MODIFIKATSII PASSAZHIRSKOGO SAMOLETA]
V. P. GOGOLIN Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 8-11. In Russian. 1990 4 p In RUSSIAN refs
Copyright
Calculations are made to determine the maximum permissible additional mass when designing passenger aircraft that can be modified to carry varying amounts of fuel for routes of different lengths. The problem is solved from the standpoint of early stages of design using fuel efficiency as the criterion. Preliminary estimates indicate that the realistic additional mass allowance can be approximately 2000 kg. V.L.

A92-16809
PROBLEM OF THE OPTIMAL CORRECTION OF A FLIGHT TEST PROGRAM FOR AN AIRCRAFT SYSTEM [K ZADACHE OPTIMAL'NOI KORREKTSII PROGRAMMY LETNYKH ISPYTANII AVIATSIONNOGO KOMPLEKSA]
V. A. TALYZIN Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 33-38. In Russian. 1990 6 p In RUSSIAN refs
Copyright
The problem of the optimal incorporation of additional tests into the existing flight test program for an aircraft system is formulated. The optimality criterion includes the cost and probability of the successful completion of the tests. The problem is formalized, reduced to a discrete programming problem with constraints, and then solved by using a successive optimization procedure. V.L.

A92-16833
COMPUTER-AIDED EQUIPMENT LAYOUT FOR THE FUSELAGE OF MANEUVERABLE AIRCRAFT [AVTOMATIZIROVANNAIA KOMPONOVKA OBORUDOVANIIA V FIUZELIAZHE MANEVRENNOGO SAMOLETA]
O. B. PASHCHENKO Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 111-113. In Russian. 1990 3 p In RUSSIAN refs
Copyright
A heuristic method for the synthesis of a layout scheme for the fuselage equipment of maneuverable aircraft is described which is based on formalized procedures commonly used in design practice. The heuristic layout design problem is solved using morphological analysis, and the design process is described in the form of a generalized algorithm. The method has been implemented in an interactive computer-aided design system. V.L.

A92-30134
AERODYNAMIC WING-NACELLE INTEGRATION [OB AERODINAMICHESKOM SOGLASOVANII KRYLA I MOTOGONDOLY]
S. I. SKOMOROKHOV and L. L. TEPERIN TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 82-88. In Russian. 1990 7 p In RUSSIAN refs
Copyright
The paper discusses the problem of aerodynamic integration of the wing and the nacelle of a subsonic passenger aircraft. The characteristics of the flow past the wing-pylon-nacelle arrangement are analyzed, and a procedure is proposed for reducing drag interference in this region. The efficiency of the procedure is demonstrated by a comparison with the results of wind-tunnel tests obtained on a series of models including those with deformed pylons and wings. I.S.

A92-30140
SELECTION OF EFFICIENT PRIMARY-STRUCTURE/FORCE CONFIGURATIONS FOR AIRCRAFT LIFTING SURFACES SUBJECTED TO DISPLACEMENT CONSTRAINTS [VYBOR RATSIONAL'NYKH KONSTRUKTIVNO-SILOVYKH SKHEM NESUSHCHIKH POVERKHNOSTEI LA PRI OGRANICHENIIAKH PO PEREMESHCHENIIAM]
A. K. KOVALEVSKII TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 112-118. In Russian. 1990 7 p In RUSSIAN refs
Copyright
A generalized optimality criterion is proposed, in the form of the requirement of a uniform energy-density distribution, for selecting efficient primary-structure/force configurations for aircraft lifting surfaces of maximum rigidity. The proposed method and the computer program based on the method are verified by solving the optimization problem for a ten-bar truss, and the results are shown to agree well with those available in the literature. As an example, the problem of selecting the primary-structure/force configuration for an all-moving aircraft stabilizer is solved. I.S.

A92-30209
GENERATION OF LOADS FOR FINITE-ELEMENT MODELS OF LARGE AIRCRAFT [FORMIROVANIE NAGRUZOK DLIA KONECHNO-ELEMENTNYKH MODELEI LETATEL'NYKH APPARATOV BOL'SHOI RAZMERNOSTI]
IU. V. GUSAK and A. A. LITVINENKO TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 6, 1990, p. 98-106. In Russian. 1990 9 p In RUSSIAN refs
Copyright
Based on a unified finite-element description of the geometry of load-calculation models, a method is proposed for the automated generation of balanced loads for a finite-element strength model for an aircraft under static loading. An example of the method's application is presented. L.M.

A92-31878
APPROXIMATE DETERMINATION OF THE EFFECT OF DEVIATIONS OF WING AND TAIL GEOMETRY FROM DESIGN PARAMETERS ON THE DRAG COEFFICIENT OF SUBSONIC AIRCRAFT [PRIBLIZHENNAIA OTSENKA VLIIANIIA OTKLONENIIA GEOMETRICHESKIKH PARAMETROV KRYLA I OPERENIIA OT TEORETICHESKIKH NA KOEFFITSIENT SOPROTIVLENIIA DOZVUKOVYKH SAMOLETOV]
V. A. BARINOV and G. A. FEDORENKO TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 2, 1991, p. 100-104. In Russian. 1991 5 p In RUSSIAN refs
Copyright
The paper presents an approximate method for determining drag-coefficient variations for subsonic aircraft in the case of deviations of the wing and tail geometry (airfoil thickness, chord, and span) from design parameters during manufacturing. A numerical example is given, and a method for representing the manufacturing-related deviations of the wing or tail section coordinates from the predicted ones is proposed. L.M.

A92-31881
INTERFERENCE OF HIGH-MOUNTED PROPFAN NACELLES WITH AN UNSWEPT WING AND WAYS TO ATTENUATE IT [INTERFERENTSIIA VERKHNERASPOLOZHENNYKH GONDOL TVVD S PRIAMYM KRYLOM I SPOSOBY EE OSLABLENIIA]
A. N. VISKOV, D. E. OKLADNIKOV, and S. M. CHERNYSHOVA TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 2, 1991, p. 113-116. In Russian. 1991 4 p In RUSSIAN
Copyright
Calculation and experimental results concerning the propfan nacelle effect on the lifting characteristics of an unswept wing are presented for different positions of the leading and trailing edge flaps. The presence of an unfavorable wing-nacelle interference

is shown, which leads to a considerable reduction of the lifting characteristics of the aircraft at high angles of attack. Some ways to attenuate this interference are examined. L.M.

A92-31893
IMPROVING THE EFFICIENCY OF PASSENGER AIRCRAFT DURING THE LANDING APPROACH [POVYSHENIE TOPLIVNOI EFFEKTIVNOSTI PASSAZHIRSKIKH SAMOLETOV PRI ZAKHODE NA POSADKU]
A. G. OBRUBOV and A. A. POGODAEV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 3, 1991, p. 61-70. In Russian. 1991 10 p In RUSSIAN
Copyright
Possible ways of improving the fuel efficiency of passenger aircraft during the landing approach are examined. In particular, it is shown that the fuel consumption can be reduced by optimizing the approach procedure (delaying the deployment of high-lift devices and reducing the number of manual operations during the deployment) and by automating the control of flaps and slats. V.L.

A92-31894
A SECOND-ORDER CONTROL OPTIMIZATION METHOD FOR NONLINEAR DYNAMIC SYSTEMS AND ITS USE FOR CALCULATING OPTIMAL AIRCRAFT TRAJECTORIES [METOD VTOROGO PORIADKA OPTIMIZATSII UPRAVLENIIA NELINEINYKH DINAMICHESKIKH SISTEM I EGO PRIMENENIE DLIA RASCHETA OPTIMAL'NYKH TRAEKTORII SAMOLETA]
O. E. EFIMOV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 3, 1991, p. 71-80. In Russian. 1991 10 p In RUSSIAN refs
Copyright
An approach to the numerical optimization of nonlinear dynamic systems is considered which is based on a discrete version of a second-order direct method. The approach makes it possible to obtain a weak local optimum with a high degree of accuracy and to construct a family of extreme solutions within a sufficiently short time. The method is suitable for solving aircraft trajectory optimization problems with a number of constraints with respect to normal acceleration loads and thrust and some trajectory parameters. The problem of achieving specified flight altitude and velocity within minimum time and with minimum consumed fuel is analyzed as an example. V.L.

A92-31896
A PROCEDURE FOR CALCULATING THE STATIC AEROELASTICITY CHARACTERISTICS OF FLIGHT VEHICLES BY THE INFLUENCE COEFFICIENT METHOD USING THREE-DIMENSIONAL FINITE ELEMENT SCHEMES [METODIKA RASCHETA KHARAKTERISTIK STATICHESKOI AEROUPRUGOSTI LETATEL'NYKH APPARATOV METODOM KOEFFITSIENTOV VLIIANIIA S ISPOL'ZOVANIEM PROSTRANSTVENNYKH SKHEM METODA KONECHNYKH ELEMENTOV]
A. A. SERGEEV and V. L. TOKAR' TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 3, 1991, p. 92-105. In Russian. 1991 14 p In RUSSIAN refs
Copyright
A procedure is described for calculating the static aeroelasticity characteristics of flight vehicle in horizontal motion by using influence coefficients and compliance matrices obtained by means of three-dimensional finite element schemes. The computational formulas of the influence coefficient method are obtained with allowance for deformations due to inertial forces, including angular acceleration. The aerodynamic elasticity coefficients of a flight vehicle calculated by the method described here are compared with the values obtained by the assumed displacement method. V.L.

A92-41176
SOME ASPECTS OF ADVANCED AIRCRAFT DEVELOPMENT
ROSTISLAV A. BELIAKOV (Mikoian Design Bureau, Moscow, Russia) May 1991 8 p

The procedures used in the development of advanced military Soviet aircraft are discussed. Special attention is given to the basics of the main conceptual approaches used in the development of new aircraft, the work sequence, and the structure of the Integrated Purpose-Oriented Program of Scientific Research and Prototype Development program organized for the development of advanced fighters. A list of main systems and complex manufacturers is presented along with data on the world-class records of the MIG aircraft. I.S.

A92-53432
NAVAL DESIGN EXPERIENCE APPLIED TO KA-50 HOKUM
BORIS RYBAK and JEFFREY M. LENOROVITZ Aviation Week & Space Technology (ISSN 0005-2175), vol. 137, no. 8, Aug. 24, 1992, p. 40-43. 24 Aug. 1992 4 p
Copyright
A review is presented of the Kamov Ka-50 army daylight antitank attack helicopter having coaxial, contrarotating rotors. Attention is given to the twin TV3-117 powerplants, weapons system configurations, avionics, and some basic performance figures. An exploded-view drawing of the vehicle that detects all subsystems is included. R.E.P.

A92-54545
RAPIDLY GOING NOWHERE?
ROY BRAYBROOK Air International (ISSN 0306-5634), vol. 43, no. 2, Aug. 1992, p. 67-73. Aug. 1992 7 p
Copyright
An overview is presented of frontline combat aircraft of the former USSR recently displayed at Minsk that demonstrate the latest military aviation developments. Attention is focussed on the SU-25 TK, an improved attack version of the basic Frogfoot A. Consideration is given to the Mig-29, SU-27, MiG-31M, and various missiles now listed as available for export sales. R.E.P.

A92-54981
MIKOYAN'S MARKET-BUSTER
ALEXANDER VELOVICH Flight International (ISSN 0015-3710), vol. 142, no. 4336, Sept. 16, 1992, p. 81-84. 16 Sep. 1992 4 p
Copyright
A review is presented of the Mikoyan design bureau's new model, the MiG-29M, to be offered for international sales; marketing strategies include its use as a jointly developed alternative to the EFA fighter program. Attention is given to the upgraded RD-33K fan engines, the full-authority digital engine control system, the weapons-control system used for various missile packages, and the FBW analog flight-control system. R.E.P.

A92-54982
WEREWOLF WARRIOR
ALEXANDER VELOVICH Flight International (ISSN 0015-3710), vol. 142, no. 4337, Sept. 23, 1992, p. 49, 50, 52-55. 23 Sep. 1992 6 p
Copyright
A review is presented of the Kamov Ka-50 Werewolf combat helicopter originally designed to outperform the AH-64 Apache, and which now may compete with the Apache on the international arms-sales market. Attention is given to the TV3-117VK powerplants rated at 2,200 shp, available weapons systems variations, and the current avionics and cockpit instrumentation displays. It is noted that a letter of intent has been signed with a U.S. company covering the possibilities of installing Western electronic systems and weapons on the Ka-50 airframe, and also of selling the Werewolf worldwide. R.E.P.

A92-56289
SAFETY PROVISION AGAINST 'GROUND RESONANCE' FREE VIBRATION OF A COAXIAL HELICOPTER
A. Z. VORONKOV and S. B. SOBOL' (Kamov Helicopter Scientific and Technology Co., Russia) European Rotorcraft Forum, 17th, Berlin, Germany, Sept. 24-26, 1991, Paper. 15 p. Sep. 1991 15 p refs

The problem of safety provision against the free vibration of the 'ground resonance' of a coaxial helicopter is addressed. The following function is plotted as a result of the work carried out to provide safety from 'ground resonance': relative damping moments in lag hinges of the upper and lower rotors vs the helicopter inertia-mass parameter, which can be used in a safety evaluation in the helicopter design process. C.A.B.

A92-56290
HELICOPTER TAIL ROTOR STALL FLUTTER
MIKHAIL ROZHDESTVENSKII (Mil Moscow Helicopter Plant, Russia) European Rotorcraft Forum, 17th, Berlin, Germany, Sept. 24-26, 1991, Paper. 15 p. Sep. 1991 15 p refs

The paper investigates stall flutter which occurs in helicopter tail rotor blades in hovering and which shows a sharp growth in the value of the pitching moment variable component. The values of the measured loads exceed the ordinary level encountered in operation by several orders of magnitude. An analytical and theoretical investigation of stall flutter is carried out on the basis of unsteady aerodynamics. The mechanism of the evolution of self-oscillations and the influence of various design parameters are investigated. Good qualitative and quantitative agreement of analytical and experimental data is obtained, and a method for reducing the pitching moment is found. Full-scale tests of the Mi-26 tail rotor confirm the efficiency of the implemented design solutions aimed at eliminating stall flutter. C.A.B.

A92-56309
AEROELASTICITY OF A COAXIAL HELICOPTER ROTOR
B. N. BURTSEV (Kamov Helicopter Scientific and Technology Co., Russia) European Rotorcraft Forum, 17th, Berlin, Germany, Sept. 24-26, 1991, Paper. 17 p. Sep. 1991 17 p

Results of development work for the coaxial-rotor lifting system generalized mathematical model are presented. The coaxial-rotor system is modeled by means of aeroelastic blade couplings through signal control links and by aeroelastic blade interaction in the coaxial rotor vortex. The numerical method and algorithm development results are discussed. R.E.P.

A92-56311
OSCILLATIONS OF AN ANISOTROPIC ROTOR ON AN ELASTIC ANISOTROPIC SUPPORT
IU. A. MIAGKOV (Mil' Design Bureau, Moscow, Russia) European Rotorcraft Forum, 17th, Berlin, Germany, Sept. 24-26, 1991, Paper. 14 p. Sep. 1991 14 p

Small oscillations of rotor blades possessing anisotropic properties along with elastic support oscillations are considered. Among these rotors are two- and single-bladed rotors of wide application and multibladed rotors with nonuniform positioning of the blades over a rotor disk. Under anisotropy of the support elastic properties an equilibrium of such rotor oscillation modes in conjunction with the support occurs solely in the case of a polyharmonic nature of motion. R.E.P.

A92-56325
COMPOSITE BLADES FOR HELICOPTER MAIN AND TAIL ROTORS DEVELOPED BY MIL DESIGN BUREAU
B. S. SIROTINSKII (Mil' Moscow Helicopter Plant, Russia) European Rotorcraft Forum, 17th, Berlin, Germany, Sept. 24-26, 1991, Paper. 12 p. Sep. 1991 12 p

The design of composite blades for helicopter main and tail rotors developed at the Mil Helicopter Plant, Moscow, for the Mi-12 experimental and Mi-26 production helicopters is examined. The design, which uses spiral lay-up of resin-preimpregnated unidirectional glass-fiber tapes, is oriented at automated blade manufacturing using numerically controlled machines for tape lay-up. The design and fabrication of the blade-to-hub attachment fitting is described. The blades are fitted with an electrothermal deicing system, which is also made of nonmetal composites. V.L.

A92-56337
DESIGN METHOD OF A HELICOPTER COCKPIT
B. A. GUBAREV (Kamov Helicopter Scientific and Technology Co., Russia) European Rotorcraft Forum, 17th, Berlin, Germany, Sept. 24-26, 1991, Paper. 14 p. Sep. 1991 14 p refs

Problems involved in developing a helicopter crew cabin layout are described. These problems are solved within the scope of the task of rendering compatible two essentially different components: the technical details of a cabin and human performance. Heterogeneity and multicriteria aspects relevant to the cockpit layout are investigated, with priority given to behavioral engineering in search of technical solutions. The task of designing a crew cabin layout and selecting its parameters at the early stages of helicopter design is addressed. In this connection, the cabin structure is based on fundamental interfunctional relations as a starting point in designing a crew cabin layout as a complete helicopter component which reflects its application roles and operational features. C.A.B.

N92-24347# RAND Corp., Santa Monica, CA.
FROM FARNBOROUGH TO KUBINKA: AN AMERICAN MIG-29 EXPERIENCE
BENJAMIN S. LAMBETH 1991 150 p Repr. from Air Force Magazine, Apr. 1990
(RAND-R-4000-RC; ISBN-0-8330-1191-X; AD-B165245L) Avail: CASI HC A07/MF A02

At the September 1988 Farnborough Air Show, the Soviet MiG-29 aircraft was demonstrated in the West for the first time. On December 15, 1989, the author became the first U.S. citizen to fly the MiG-29 and the first Western pilot invited to fly a combat aircraft of any type inside Soviet airspace since the end of World War 2. This report documents that experience in detail. The most extensive part of the report is the author's account of his MiG-29 flight and what that experience revealed about the aircraft's technical features, cockpit layout, and handling characteristics. H.A.

06

AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

N92-13066# Air Force Systems Command, Wright-Patterson AFB, OH. Foreign Technology Div.
SOVIET ELECTRONIC DISPLAY SYSTEMS UNDER RESEARCH AND MANUFACTURED FOR THE CIVIL AVIATION AIRCRAFT OF THE 1990'S
LING ZHIQIN 25 Jul. 1991 12 p Transl. into ENGLISH from Aviation Production Engineering (China), no. 5, May 1989 p 28 and 29
(AD-A240933; FTD-ID(RS)T-0289-91) Avail: CASI HC A03/MF A01

For many years, scientific research and production of on-board electronic equipment on Soviet civil aviation aircraft primarily directed its efforts to the resolution of the problems of guaranteeing a high degree of flight safety, and lowering operating expenses. Lightening the operating responsibilities of the aircrews is an effective method of raising the safety of flying. The operating responsibilities of aircrew personnel are primarily determined by the information capacity and orderliness of the whole set of on-board equipment. The question of lightening aircrew operating responsibilities, in the last ten years, has had special practical significance. The reason for this is that, in this time period, civil aviation aircraft have been equipped with various types of new model guidance and communications gear, automatic flight control equipment, and electric supply equipment. In conjunction with this, there has been a choice to make use of new piloting principles, such as those based on opting for the use of overall energy amount information. GRA

07

AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

A92-15691
DEVELOPMENT AND BENCH TEST OF HIGH-TEMPERATURE COMBUSTION CHAMBER WITH STRUCTURAL CERAMIC COMPONENTS
A. V. SUDAREV, IU. I. ZAKHAROV, G. N. LIUBCHIK, L. S. BUTOVSKII, and E. A. GRANOVSKAIA (Vsesoiuznyi Nauchno-Issledovatel'skii Tekhnologicheskii Institut Energeticheskogo Mashinostroeniia, Leningrad, USSR; Kievskii Politekhnicheskii Institut, Kiev, Ukrainian SSR) ASME, International Gas Turbine and Aeroengine Congress and Exposition, 36th, Orlando, FL, June 3-6, 1991. 3 p. Jun. 1991 3 p refs
(ASME PAPER 91-GT-315)

The paper describes the design of an efficient high-temperature combustion chamber with a ceramic dome for a combustor that is intended to operate with the air preheated at the inlet to 900 C. Results of tests showed that the combustor is capable of high serviceability over a wide range of operational parameters. At a combustor inlet air temperature of 600 C, the maximum temperature of the flameholder wall was 800 C and the maximum temperature of the liner was 1000 C. I.S.

A92-16819
A METHOD FOR DETERMINING THE OPTIMAL COMPOSITION OF THE MEASURED PARAMETERS IN DIAGNOSING GAS TURBINE ENGINES [METOD OPREDELENIIA OPTIMAL'NOGO SOSTAVA IZMERIAEMYKH PARAMETROV PRI DIAGNOSTIROVANII GTD]
G. E. GRECHIKHA Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 71-75. In Russian. 1990 5 p In RUSSIAN refs
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An algorithm is proposed for evaluating the diagnostic value of the parameters of gas turbine engines and other linear plants. The algorithm makes it possible to determine the optimal composition of the measured parameters for specified diagnostic conditions. The diagnostic value of a given parameter is determined as the difference of the amount of the useful information and the noise introduced by the measured parameter. V.L.

A92-16828
EFFECT OF EULERIAN INERTIA FORCES ON THE STRESSED STATE OF THE ROTATING COMPONENTS OF AIRCRAFT TURBOMACHINES [VLIIANIE EILEROVYKH SIL INERTSII NA NAPRIAZHENNOE SOSTOIANIE VRASHCHAIUSHCHIKHSIA DETALEI TURBOMASHIN LA]
A. IU. DRONNIK Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 99-102. In Russian. 1990 4 p In RUSSIAN refs
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The effect of Eulerian inertia forces on the rotating parts of powerplant turbines in flight is investigated analytically. It is shown, in particular, that stresses generated by Eulerian inertia forces in the rotating parts of the turbines vary from several percent to a few tens of percent of the permissible stress. The resulting stresses are superposed on the nearly ultimate tensile and bending stresses generated by the centrifugal and gas pressure forces. An illustrative example is presented. V.L.

A92-16831
EFFECT OF THE BLADE HEIGHT OF THE NOZZLE RING OF AXIAL-FLOW MICROTURBINES ON THE FLOW VELOCITY FACTOR AND EXIT ANGLE [VLIIANIE VYSOTY LOPATOK SOPLOVOGO APPARATA OSEVYKH MIKROTURBIN NA KOEFFITSIENT SKOROSTI I UGOL VYKHODA POTOKA]
N. T. TIKHONOV and E. E. PFAIFLE Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 107-109. In Russian. 1990 3 p In RUSSIAN refs
Copyright

The effect of the blade height of the nozzle ring on the flow velocity factor and exit angle of microturbines was investigated experimentally using six nozzle rings with blade heights of 0.5, 1, 2, 3, 4, and 5 mm. It is found that the flow exit angle increases continuously with the relative height of the nozzle ring blades. The flow velocity factor increases significantly (from 0.845 to 0.925 at Mach 1.8) as the relative blade height increases from 0.01 to 0.04. With a further increase in the blade height from 0.04 to 0.07, the velocity factor increases to a lesser extent (from 0.925 to 0.94 at Mach 1.8). V.L.

A92-18198
AERODYNAMIC DAMPING OF BLADE VIBRATIONS IN TURBOMACHINES [AERODINAMICHESKOE DEMPFIROVANIE KOLEBANII LOPATOK TURBOMASHIN]
GEORGII S. PISARENKO and ARKADII A. KAMINER Kiev, Izdatel'stvo Naukova Dumka, 1991, 304 p. In Russian. 1991 304 p In RUSSIAN refs
Copyright

Results of a study of the aerodynamic damping of blade vibrations in turbomachines are reported, with allowance made for factors determining the interaction of vibrating blades with the flow. In particular, attention is given to methods for determining the characteristics of aerodynamic damping of blade vibrations, principles governing the design of models used in experimental studies of aerodynamic damping, modeling of nonstationary aerodynamic processes, and equipment used in aerodynamic damping studies. V.L.

A92-18292
A PROBABILISTIC METHOD FOR MONITORING THE REMAINING LIFE OF AIRCRAFT GAS TURBINE ENGINE COMPONENTS USING THE TEMPERATURE LIMIT CRITERION [VEROIATNOSTNYI METOD KONTROLIA RASKHODOVANIIA RESURSA DETALEI AGTD PO KRITERIIU PREDEL'NOI TEMPERATURY]
A. N. VETROV, A. G. KUCHER, and N. A. SNEGIREV (Kievskii Institut Inzhenerov Grazhdanskoi Aviatsii, Kiev, Ukraine) Problemy Prochnosti (ISSN 0556-171X), Oct. 1991, p. 54-58. In Russian. Oct. 1991 5 p In RUSSIAN refs
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A method is proposed for predicting the remaining life of aircraft engine components is proposed which is based on the probabilistic comparison of the the maximum in-flight temperatures of the components with the temperature limits of their materials. The maximum temperature and temperature limit distributions are described by extreme-value laws whose parameters can be best estimated by the least squares method. A series of integral relations for the gamma-percent remaining life are obtained which require the use of numerical methods. V.L.

A92-29711
ON THE EXPERIMENTAL INVESTIGATION OF AIR-BREATHING ENGINE OF NEW SCHEMES
V. I. BAKULEV and I. V. KRAVCHENKO (Moskovskii Aviatsionnyi Institut, Moscow, Russia) IN: CUSAE '91; Proceedings of the 1st China-USSR Seminar on Aero Engines, Nanjing, People's Republic of China, Apr. 15-20, 1991 1991 8 p

An evaluation is made of the configurational possibilities suggested by the availability of hydrogen fuel for aircraft propulsion systems exhibiting high specific thrust and low specific fuel consumption. The present investigation gives attention to unique characteristics of the thermodynamic cycle, control requirements, etc, of such powerplant configurations, as they would be scaled for very small applications. O.C.

A92-29731
SIMULATION OF VIBRATIONAL STATUS OF GAS-TURBINE ENGINE
V. SAMOKHIN and A. IVANOV (Moskovskii Aviatsionnyi Institut,

Moscow, Russia) IN: CUSAE '91; Proceedings of the 1st China-USSR Seminar on Aero Engines, Nanjing, People's Republic of China, Apr. 15-20, 1991 1991 7 p refs

Design-phase methodologies are presented for gas turbine engines. These mathematical models fall into three categories: (1) axisymmetric, considering such components as rotors, engine cases, and engine mounts; (2) anisotropic, involving the differences in rigidity and inertial characteristics of elements in mutually-perpendicular surfaces; and (3) nonaxisymmetric, taking into account those centers of dynamic bending that are not on the engine axis. Attention is given to the application of these three methods to specific engines and with varying degrees of accuracy. O.C.

A92-30133
PROBLEMS OF STRENGTH AND AEROELASTICITY OF PRESENT-DAY PROPFANS [PROBLEMY PROCHNOSTI I AEROUPRUGOSTI SOVREMENNYKH VINTOVENTILIATOROV /VV/]
B. B. MARTYNOV and G. M. FOMIN TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 71-81. In Russian. 1990 11 p In RUSSIAN refs
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The design characteristics of the propfan-engine (PFE) are formulated and compared with those of traditional propellers, showing their substantial differences with respect to geometry, structural materials, and load levels. Special attention is given to the aeroelasticity problems of PFEs, the various types of the flutter phenomenon specific to PFEs, and to the principles involved in simulating the dynamic PFE processes and in designing dynamically scaled PFE models with the use of composite materials. I.S.

A92-30381
RESTORATION OF AIRCRAFT ENGINE NOZZLE BLOCK BLADES BY VACUUM ARC BRAZING WITH CONTROLLED CURRENT [VOSSTANOVLENIE LOPATOK SOPLOVOGO APPARATA AVIATSIONNYKH DVIGATELEI DUGOVOI PAIKOI V VAKUUME S PROGRAMMNYM REGULIROVANIEM TOKA]
V. M. VOROB'EV Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriia Mashinostroenie (ISSN 0236-3941), Oct.-Dec. 1990, p. 97-101. In Russian. Dec. 1990 5 p In RUSSIAN refs
Copyright

The technology of vacuum arc brazing with current controlled according to a specified program is described, and its application to the restoration of engine nozzle block blades is considered. Results of a study of the effects of discharge-current variations on the formation of the joint and the macrostructure of the weld seam are presented. L.M.

A92-31696#
WIDE-RANGE COMBUSTION CHAMBER OF RAMJET
S. I. BARANOVSKII and V. M. LEVIN (Moskovskii Aviatsionnyi Institut, Moscow, Russia) AIAA, International Aerospace Planes Conference, 3rd, Orlando, FL, Dec. 3-5, 1991. 3 p. Dec. 1991 3 p refs
(AIAA PAPER 91-5094) Copyright

The development and testing of a ramjet wide-range combustion chamber is described with attention given to the optimization of the mixture-formation system. Structures called micropylons are introduced into the flow to generate small disturbances that enhance the uniformity of fuel distribution. The ramjet has a short combustion chamber with an optimized shape, and the experimental results indicate that the thermal intensity in the combustion chamber can be maximized by enhancing fuel combustion efficiency and minimizing chamber length. C.C.S.

A92-32296
RUSSIANS WANT U.S. TO JOIN SCRAMJET TESTS
STANLEY W. KANDEBO Aviation Week and Space Technology (ISSN 0005-2175), vol. 136, March 30, 1992, p. 18-20. 30 Mar. 1992 3 p
Copyright

U.S. collaboration on the Russian test flight of a subscale axisymmetric ramjet/scramjet (RS) is reported with attention given to the RS's potential for supersonic combustion in flight. The RS is described in terms of its potential applications and technological benefits, and the participation by the U.S. government is concluded to be a result of waning Russian funds for aerospace activities. The test apparatus and the RS are described in detail, and further cooperation with the U.S. is expected for the testing of the RS in a large rocket which could reach about Mach 10. C.C.S.

A92-32297
GE, SNECMA CONSIDER VENTURE TO DEVELOP UPRATED PERM PS-90
Aviation Week and Space Technology (ISSN 0005-2175), vol. 136, March 30, 1992, p. 40, 41. 30 Mar. 1992 2 p
Copyright

The potential development of an uprated version of the Russian design bureau Perm's PS-90A turbofan engine is reported, and three development philosophies are compared. An intermediate solution is emphasized in which the engine's fan and booster would be made more efficient and the power-plant's turbine-inlet temperature would be reduced. The intermediate-solution uprated Perm PS-90 is expected to have a rating of about 17,000-18,000 kgf as opposed to the present 16,000 kgf. C.C.S.

A92-32299
SATURN/LYULKA DIVERSIFIES BUSINESS TO COPE WITH RUSSIAN ECONOMIC CRISIS
Aviation Week and Space Technology (ISSN 0005-2175), vol. 136, March 30, 1992, p. 44-46. 30 Mar. 1992 3 p
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The business strategy of the Russian design bureau Saturn/Lyulka is described including diversification into areas not directly related to the aerospace and participation in civil/commercial aviation projects. The development of turboprop/turboshaft engines is discussed with attention given to a lightweight heat exchanger designed for the engines. The bureau plans to incorporate full-authority digital engine control into naval engines and to develop a supersonic engine for commercial jets. C.C.S.

A92-36421
A METHOD FOR DETERMINING EQUIVALENT STRESSES IN AVIATION GAS TURBINE ENGINE BLADES [SPOSOB OPREDELENIIA EKVIVALENTNYKH NAPRIAZHENII V LOPATKAKH AVIATSIONNYKH GTD]
V. V. MALYGIN, D. G. FEDORCHENKO, and S. R. ZALAUTDINOV (NPO Trud, Samara, Russia) Problemy Prochnosti (ISSN 0556-171X), no. 2, 1992, p. 45-48. In Russian. 1992 4 p In RUSSIAN refs
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A method is presented for estimating the damage that is caused by random dynamic stresses in the blades of aviation gas turbine engines. The method is based on the analytical/experimental determination of equivalent stresses and makes it possible to obtain sufficiently accurate damage estimates without a substantial increase in the time required for the analysis of dynamic strain measurements. An implementation of the method on a specialized hardware/software system for the analysis of dynamic strain data obtained in bench testing is presented. V.L.

A92-40606
A METHOD FOR ESTIMATING THE EFFICIENCY OF GAS TURBINE BLADE COOLING SYSTEMS [METOD OTSENKI EFFEKTIVNOSTI SISTEMY OKHLAZHDENIIA LOPATOK GAZOVYKH TURBIN]
M. N. GALKIN, K. A. MALINOVSKII, I. V. SHEVCHENKO, and M. S. CHERNYI Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1991, p. 27-30. In Russian. 1991 4 p In RUSSIAN refs
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A new expression is proposed for the efficiency of gas turbine blade cooling. The expression has the form of a function characterizing the work required for pushing the cooling air through

the internal cavity of a hollow blade. Such a generalized expression for the blade cooling efficiency is convenient for comparing results obtained for different air flow rates and pressure gradients and makes it possible to use experimental data available from different sources. V.L.

A92-40607
PLOTTING THE UNIVERSAL CHARACTERISTIC OF A COMPRESSOR IN LOW-RPM AND AUTOROTATION REGIMES [POSTROENIE UNIVERSAL'NOI KHARAKTERISTIKI KOMPRESSORA V OBLASTI MALYKH REZHIMOV I NA REZHIMAKH AVTOROTATSII]
V. I. DAINEKO Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1991, p. 30-34. In Russian. 1991 5 p In RUSSIAN refs
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The existing methods for plotting the universal characteristic of a compressor at low rpm are presented and analyzed. A more general expression is then proposed which makes it possible to plot the universal characteristic not only at low rpm but also for autorotation regimes. The validity of the method is supported by experimental data. V.L.

A92-40608
A MODEL OF THE OPERATION OF THE PULSEJET ENGINE AND A STUDY OF ITS CHARACTERISTICS [MODEL' RABOCHEGO PROTSESSA I ISSLEDOVANIE KHARAKTERISTIK PUL'SIRUIUSHCHEGO VRD]
P. P. KOSTENKO, D. A. MUNSHTUKOV, V. L. SIMBIRSKII, and K. V. BELIAKOV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1991, p. 34-38. In Russian. 1991 5 p In RUSSIAN refs
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A mathematical model describing the operation of the pulsejet engine is presented. The performance characteristics of the pulsejet engine are analyzed using the method of flow singularities expressed in terms of mass, impulse, and energy sources (sinks). The dependence of the pulsejet parameters on the flow path geometry and fuel combustion characteristics is discussed. V.L.

A92-40609
HEAT TRANSFER ON A CYLINDRICAL SURFACE IN THE CAVITIES OF GAS TURBINE ENGINE ROTORS [TEPLOOTDACHA NA TSILINDRICHESKOI POVERKHNOSTI V POLOSTIAKH ROTOROV GAZOTURBINNYKH DVIGATELEI]
N. N. SALOV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1991, p. 43-48. In Russian. 1991 6 p In RUSSIAN refs
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Experimental data on heat transfer on a cylindrical surface inside rotating annular cavities are presented for different coolant flow patterns. The results of the experiments are generalized in the context of similarity theory. The cooling schemes considered are compared in terms of cooling efficiency. V.L.

A92-40610
LOW-FREQUENCY VIBRATIONS OF THE SHUTTERS OF THE VARIABLE LAVAL NOZZLE OF GAS TURBINE ENGINES [NIZKOCHASTOTNYE KOLEBANIIA STVOROK REGULIRUEMOGO SOPLA LAVALIA GTD]
IU. I. TSYBIZOV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1991, p. 48-52. In Russian. 1991 5 p In RUSSIAN refs
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The factors responsible to the low-frequency vibrations of the shutters of a variable Laval nozzle are identified, and the mechanisms of this phenomenon are examined. Expressions for calculating the shutter vibrations are presented. It is shown that the low-frequency vibrations can be significantly reduced by profiling the subsonic section of the nozzle. V.L.

A92-40621
A METHOD FOR ESTIMATING THE TECHNOLOGICAL AND ECONOMIC EFFICIENCY OF MEASURES ENHANCING THE RELIABILITY OF AVIATION GAS TURBINE ENGINES [METODIKA OTSENKI TEKHNIKO-EKONOMICHESKOI EFFEKTIVNOSTI MEROPRIIATII, POVYSHAIUSHCHIKH NADEZHNOST' AVIATSIONNYKH GTD V EKSPLUATATSII]
A. I. EVDOKIMOV and A. I. RYDAEV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1991, p. 95-99. In Russian. 1991 5 p In RUSSIAN refs
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A mathematical model is presented which describes the effect of various steps aimed at reducing the premature engine dismantling on the integral reliability characteristics of gas turbine engines. The reliability-enhancing measures are then analyzed from the standpoint of their technological and economic efficiency. Some specific examples are discussed. V.L.

A92-54135#
THE STUDY OF EXPERIMENTAL TURBORAMJETS
V. A. SOSOUNOV, M. M. TSKHOVREBOV, V. I. SOLONIN, and V. A. PALKIN (Central Institute of Aviation Motors, Moscow, Russia) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 28th, Nashville, TN, July 6-8, 1992. 9 p. Jul. 1992 9 p refs
(AIAA PAPER 92-3720) Copyright

A survey and development status evaluation is presented or experimental turboramjet systems that are under study at Moscow's Central Institute for Aviation Motors. Both turbojet- and turbofan-based systems have been tested and analyzed with a view to their optimal behavior during transition from turbine-powered to ramjet-sustained operational modes, as well as the conditions for stable operation, and the windmilling mode of the core engine's operation. These studies are being conducted for possible application to hypersonic atmospheric vehicle and transatmospheric aerospace plane applications. O.C.

A92-54546
CIS ENGINES - THE RANGE REVEALED. II
KEN FULTON Air International (ISSN 0306-5634), vol. 43, no. 2, Aug. 1992, p. 91-96. Aug. 1992 6 p
Copyright

A review is presented of aircraft engines currently in an operational status or under development in the former USSR. Attention is given to the new Soyuz RDK-300-10 single-shaft turbofan design intended for UAVs or as a pylon-mounted takeoff booster for aircraft. A listing is provided of Russian and Ukrainian gas turbine and piston engines that includes basic takeoff thrust and aircraft installations for each of the powerplants. R.E.P.

08

AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

A92-16801
AERODYNAMIC BALANCE RANGE OF AIRCRAFT OF DIFFERENT CONFIGURATIONS [DIAPAZON TSENTROVOK LEGKIKH SAMOLETOV RAZLICHNYKH SKHEM]
A. A. BADIAGIN Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 3-7. In Russian. 1990 5 p In RUSSIAN refs
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The aerodynamic balance range of light subsonic aircraft is examined for five different configurations: the classical configuration, canard, the tailless configuration, three-surface configuration, and the tandem configuration. The effect of the fuselage and powerplant on the aerodynamic balance is neglected.

Of the configurations investigated, the tandem scheme is shown to have the widest balance range, whereas the canard configuration has the smallest range. V.L.

A92-16803
OPTIMIZATION OF THE AERODYNAMIC BALANCE AND PARAMETERS OF THE HORIZONTAL TAIL SURFACES OF THE THREE-SURFACE AIRCRAFT CONFIGURATION WITH ALLOWANCE FOR THE CAPABILITIES OF THE STABILITY AND CONTROL AUGMENTATION SYSTEM [OPTIMIZATSIIA TSENTROVKI I PARAMETROV GORIZONTAL'NOGO OPERENIIA SAMOLETA SKHEMY 'TRIPLAN' S UCHETOM VOZMOZHNOSTEI SISTEMY ULUCHSHENIIA USTOICHIVOSTI I UPRAVLIAEMOSTI]
V. P. SURIN, O. P. ZORINA, and IU. I. MAL'TSEV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 11-14. In Russian. 1990 4 p In RUSSIAN refs
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The problem of optimizing the aerodynamic balance parameters of the three-surface configuration is formulated as a nonlinear programming problem using the integral energy maneuverability of the aircraft as the criterion. The automatic control system is represented by a static longitudinal control automaton. Solution results are presented for a hypothetic maneuverable three-surface aircraft. V.L.

A92-16807
CONSIDERATION OF THE TIME LAG OF ENGINE PROCESSES IN THE PROBLEM OF VTOL AIRCRAFT CONTROL SYNTHESIS [UCHET INERTSIONNOSTI PROTSESSOV DVIGATELEI V ZADACHE SINTEZA UPRAVLENIIA SVVP]
A. I. BOGOMOLOV and P. K. SEMENOV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 24-28. In Russian. 1990 5 p In RUSSIAN refs
Copyright
The problem of the synthesis of a decoupling filter for a VTOL aircraft manual control system is analyzed with allowance for the effect of the time lag of engine processes. A simple method of compensating for the time lag is proposed. The validity of the approach is demonstrated by results of a numerical simulation. V.L.

A92-16808
CONTROL OF THE LANDING OF A FLIGHT VEHICLE IN THE GRAZING-INCIDENCE MODE [UPRAVLENIE PRIZEMLENIEM LETATEL'NOGO APPARATA V SKOL'ZIASHCHEM REZHIME]
A. I. ZOTEEV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 28-33. In Russian. 1990 6 p In RUSSIAN refs
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A nonlinear law is proposed for controlling the motion of a flight vehicle at the stage of landing. The control law is synthesized on the basis of force control in a class of piecewise continuous functions with discontinuities of the first kind. The control law provides for motion along a specified trajectory in the grazing-incidence mode. V.L.

A92-30131
THE ANALYSIS AND APPROXIMATE REPRESENTATION OF THE OPTIMAL CONTROL LAW FOR A MANEUVERABLE AIRCRAFT [ANALIZ I PRIBLIZHENNOE PREDSTAVLENIE OPTIMAL'NOGO ZAKONA UPRAVLENIIA MANEVRENNYM SAMOLETOM]
O. V. BALABANOV and V. T. PASHINTSEV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 49-61. In Russian. 1990 13 p In RUSSIAN refs
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The paper considers a problem of a time-optimal lift, roll, and thrust control for an aircraft velocity turned to a given course angle. The optimal control structure is analyzed. Near-optimal control laws are obtained as functions of time, phase coordinates, and a number of constants. Examples are provided for calculations of near-optimal trajectories, and they are compared with exact solutions. I.S.

A92-30132
ESTIMATING THE PROBABILITY OF A SAFE FLIGHT FOR AN AIRCRAFT FLYING UNDER THE EFFECT OF DISTURBANCES [OTSENKA VEROIATNOSTI BEZOPASNOGO POLETA LETATEL'NYKH APPARATOV PRI DEISTVII VOZMUSHCHENII]
V. P. KUZ'MIN TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 62-70. In Russian. 1990 9 p In RUSSIAN refs
Copyright
The paper considers an approximate numerical method for determining the probability that the phase coordinates describing the motion of an aircraft to leave the bounds of a specified region during a given time period. The effect of random disturbances on the aircraft is investigated with special attention given to the case where the probability of the phase coordinates leaving the specified region is small, permitting the application of asymptotic probabilistic estimates. A problem is solved in which the specified angles of attack are exceeded due to random gusts. I.S.

A92-30149
DYNAMICS OF HELICOPTER TIP-OVER DURING TAXIING [DINAMIKA OPROKIDYVANIIA VERTOLETA PRI RULENII]
A. M. VOLODKO TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 2, 1990, p. 73-83. In Russian. 1990 11 p In RUSSIAN refs
Copyright
The problem of the nonstationary controlled curvilinear motion of a helicopter on the ground is investigated analytically in connection with the known cases of helicopter tip-over while making sharp turns during taxiing. The conditions leading to tip-over during turning on the ground are determined from the results of the calculations, and methods of preventing the tip-over are discussed. V.L.

A92-30150
ESTIMATION OF THE OPTIMAL LOAD CHARACTERISTICS OF AIRCRAFT CONTROL LEVERS [OTSENKA OPTIMAL'NYKH KHARAKTERISTIK ZAGRUZKI RYCHAGOV UPRAVLENIIA SAMOLETOM]
L. E. ZAICHIK and V. V. RODCHENKO TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 2, 1990, p. 84-93. In Russian. 1990 10 p In RUSSIAN refs
Copyright
Based on a generalization of the known characteristics of the pilot as the operator in the man-machine system, a criterion (Z-criterion) is proposed for the estimation of the optimal load characteristics of the aircraft control levers. This criterion is then used to extend the A-criterion, proposed in an earlier study (Zaichik et al., 1986) to different load characteristics of the control levers. The A-criterion makes it possible to estimate the optimal values of the static controllability characteristics as a function of the dynamic aircraft characteristics. V.L.

A92-30190
CHARACTERISTICS OF THE PHUGOID MOTION OF NONMANEUVERABLE AIRCRAFT [OSOBENNOSTI FUGOIDNOGO DVIZHENIIA NEMANEVRENNOGO SAMOLETA]
V. A. GRIGOR'EV and V. K. SVIATODUKH TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 5, 1990, p. 59-68. In Russian. 1990 10 p In RUSSIAN refs
Copyright
The possibility of simplifying equations of longitudinal nonperturbed motion for the analysis of the phugoid (long-period) motion of nonmaneuverable aircraft is examined. It is shown that, even in the case of separable roots of the characteristic equations, the use of assumptions 'eliminating' the dynamics of the short-period component may lead to significant errors in phugoid motion determinations. A new interpretation of phugoid motion is proposed which emphasizes the forces and moments associated with changes in the flight velocity and/or height. The efficiency of

the approach proposed here is demonstrated by an example in which the short-period and phugoid motions are separated in the frequency domain. V.L.

A92-30191
ANALYSIS OF THE STABILITY OF THE LATERAL MOTION OF AIRCRAFT [ANALIZ USTOICHIVOSTI BOKOVOGO DVIZHENIIA SAMOLETA]
A. V. VLADIMIROV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 5, 1990, p. 69-82. In Russian. 1990 14 p In RUSSIAN refs
Copyright

A method is proposed for the approximate estimation of the roots of the characteristic (fourth-order) equation of the lateral motion of aircraft. It is shown that, in addition to high accuracy, the method provides a high degree of clarity and simplicity in the analysis of the effect of the aerodynamic parameters determining the lateral motion of aircraft on the roots of the equation. V.L.

A92-30192
DETERMINATION OF THE MEAN DURATION OF NORMAL ACCELERATION LOADS AT THE CENTER OF MASS OF AIRCRAFT DURING A FLIGHT IN A TURBULENT ATMOSPHERE [OPREDELENIE SREDNEI PRODOLZHITEL'NOSTI NORMAL'NYKH PEREGRUZOK V TSENTRE MASS SAMOLETA PRI POLETE V TURBULENTNOI ATMOSFERE]
A. V. ALAKOZ and M. A. ERUSALIMSKII TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 5, 1990, p. 83-91. In Russian. 1990 9 p In RUSSIAN refs
Copyright

Based on the hypothesis of the local normality of atmospheric turbulence, an expression is obtained for determining the mean time of normal acceleration loads at the center of mass of aircraft in the presence of wind gusts. Calculations based on these expressions are compared with direct measurements based on on-board recorder data, and the agreement is shown to be better than that for the standard atmospheric turbulence model. V.L.

A92-31865
LIFTING SURFACE DESIGN USING THE PRINCIPLE OF PASSIVE CONTROL OF ELASTIC CHARACTERISTICS [PROEKTIROVANIE NESUSHCHEI POVERKHNOSTI S PRIMENENIEM PRINTSIPA 'PASSIVNOGO' UPRAVLENIIA UPRUGIMI KHARAKTERISTIKAMI]
E. K. LIPIN and V. E. TENIAEVA TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 1, 1991, p. 103-106. In Russian. 1991 4 p In RUSSIAN
Copyright

Results of an analysis of efficient design schemes of forward horizontal control surfaces are reported. In particular, attention is given to two design approaches, a maximum stiffness design and a flexible design scheme. The elastic deformations of the structure are controlled by varying the number and orientation of the plies of the composite material. V.L.

A92-55366#
STOCHASTIC SELF-INDUCED ROLL OSCILLATIONS OF SLENDER DELTA WING AT HIGH ANGLES OF ATTACK
M. GOMAN, A. KHRABROV, and A. STUDNEV (Central Aerohydrodynamics Institute, Zhukovski, Russia) IN: AIAA Atmospheric Flight Mechanics Conference, Hilton Head Island, SC, Aug. 10-12, 1992, Technical Papers. Pt. 2 1992 9 p refs
(AIAA PAPER 92-4498) Copyright

This paper summarizes some new experimental study of wing rock mechanisms. The wind tunnel tests data, demonstrating new type of wing rock-stochastic oscillations are presented. To simulate this phenomena, a mathematical model of unsteady nonlinear aerodynamics was proposed. Two unsteady phenomena, vortex core dynamics and vortex breakdown dynamics, were investigated separately in the framework of the mathematical model. Analytical analysis of damping effect during wing rock was conducted using proposed mathematical model. Nondimensional mathematical model of wing rock mechanism was analyzed. Different types of oscillations were revealed. The dependence of oscillations type on the initial disturbances, observed in experiments, was simulated. Phase portraits and moment dependencies of different types of wing rock are presented. Author

A92-56284
THE SOLUTION OF THE HELICOPTER FLIGHT DYNAMICS TASKS BY THE METHODS OF OPTIMAL CONTROL THEORY
L. N. NIKIFOROVA (Kamov Helicopter Scientific and Technology Co., Russia) European Rotorcraft Forum, 17th, Berlin, Germany, Sept. 24-26, 1991, Paper. 20 p. Sep. 1991 20 p

A package of applied programs is created to solve a number of practical tasks for definition of helicopter maneuver capabilities at the modes of the limiting values of the flight parameters, to examine complex flight modes and to provide for the helicopter flight mode automation. Determination of the effect of the design constraints upon the helicopter turn angle in hover and the Ka-32 helicopter autorotation landing task at different flight weights are examined. It is shown that using the optimal control method for solution of the helicopter flight dynamics task will allow more effective utilization of the existing reserves and will assure that all the existing constraints are observed. R.E.P.

09

RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

A92-15021
FLIGHT TEST CONTROL [UPRAVLENIE LETNYM EKSPERIMENTOM]
LEONID M. BERESTOV, VIL'GEL'M V. VID, VADIM V. GORIN, VALERII I. MEL'NIK, ALEKSANDR I. FAL'KOV, and VIKTOR N. IAKOVLEV Moscow, Izdatel'stvo Mashinostroenie, 1990, 144 p. In Russian. 1990 144 p In RUSSIAN refs
Copyright

Control systems used in the testing of experimental aircraft and helicopters and also in experiments on board flying laboratories are described. In particular, attention is given to the objectives and conditions of flight testing, principal requirements for flight test control systems, and the general design of automatic control systems used in flight tests. The discussion also covers software used in computerized flight test control systems, simulations of airborne systems, and optimization of flight test conditions. V.L.

A92-16830
A TEST BENCH FOR EVALUATING POWERPLANT ELECTRIZATION [EKSPERIMENTAL'NYI STEND DLIA ISSLEDOVANIIA ELEKTRIZATSII ENERGOUSTANOVOK]
G. P. POTAPOV, G. B. MURAV'EV, R. KH. SABIROV, T. A. CHAKKAEV, and A. A. ZADNEV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 105-107. In Russian. 1990 3 p In RUSSIAN refs
Copyright

The general design, principle of operation, and main components of a test bench developed for the experimental investigation of the electrization of powerplants are described. The main components of the test bench include a burner, a fuel (propane-butane mixture) supply system, an air supply system, and instruments for the monitoring and recording of operating and electrophysical parameters. An evaluation of the performance of the test bench has demonstrated high reliability and repeatability of test results over a wide range of gasdynamic conditions. V.L.

the orbital elements. The erosion effect is modeled in the present work by incorporating degradation effects in the equations of the perturbed orbital heliocentric motion of the spacecraft with the solar sail. Attention is given to models for the deterioration in the optical reflection properties and in the effective working surface of the sail. L.M.

A92-28490
ORBITAL DEBRIS - THE VIEW FROM RUSSIA
YU. A. MOZJOURIN and S. V. CHEKALIN Aerospace America (ISSN 0740-722X), vol. 30, March 1992, p. 15-17. Mar. 1992 3 p
Copyright

Recommendations are made for integrated modeling and monitoring of space debris and curbing the levels of orbiting spacecraft fragments. Promising measures include the development of universal space platforms capable of replacing several satellites and the development of separation devices for launcher stages and spacecraft. Structures and coatings resistant to space environmental effects and secondary erosive emissions need to be developed. C.D.

A92-36594
ROCKETS OF THE FUTURE (2ND REVISED AND ENLARGED EDITION) [RAKETY BUDUSHCHEGO /2ND REVISED AND ENLARGED EDITION/]
VALERII P. BURDAKOV and IURII I. DANILOV Moscow, Energoatomizdat, 1991, 176 p. In Russian. 1991 176 p In RUSSIAN refs
(ISBN 5-283-03883-1) Copyright

The physical problems and technical difficulties that have to be solved in conceptualizing rockets of the far future are reviewed in popular form. Particular attention is given to physical principles underlying the operation of current rockets and principles that can be used to design more efficient rockets of the future. The concepts discussed include a through-flow space engine, a photon rocket, and antigravity. V.L.

A92-47950
THE PROBLEM OF MANMADE CONTAMINATION OF THE UPPER ATMOSPHERE AND THE NEAR-EARTH SPACE - SIMULATION OF SPACE-TIME EVOLUTION OF PARTICULATE IN LOW ORBITS
A. A. GAVRILOV, A. A. KHANANIAN, IU. I. PORTNIAGIN, and Z. V. ZUEVA (NPO Taifun, Obninsk, Russia) Dec. 1992 4 p refs
Copyright

A numerical algorithm for solving the equation of motion in a coordinate system immobile relative to the earth is developed to estimate the influence of aerodynamic drag on space-time evolution and the separation of small man-made debris. The origin of this coordinate system coincides with the ejection source, the X-axis is the trajectory of vehicle motion, the Y-axis is perpendicular to the orbital plane, and the Z-axis is the radius-vector. Graphs illustrate the particle distribution in the XZ plane, and the distribution of engine ejection products (particles ranging from 1.5 to 10 mm in diameter) at 300 km in the orbital plane 100 s after the ejection in the direction of vehicle motion. P.D.

A92-51334
PROBLEMS OF HUMANIZATION IN COSMONAUTICS [PROBLEMY GUMANIZATSII V KOSMONAVTIKE]
G. A. BUL'DIAEV (Institut Podgotovki i Perepodgotovki Korporatsii 'Rosobshchemash', Russia) Priroda (ISSN 0032-874X), no. 3, March 1992, p. 8-15. In Russian. Mar. 1992 8 p In RUSSIAN
Copyright

The paper discusses the ways of improving humanization of space-related science and technology projects, using the development of the space-rocket industry as an example. Consideration is given to ways of optimizing the military space-rocket programs with respect to minimizing environmental pollution and losses to arable and pasture land and maximizing benefits from rockets for scientific and agricultural programs. It is noted that the present economical crisis makes the continuation of the space project Buran not rational and that money saved would be better spent on the further development of the Energiia-series carriers. Attention is also given to work done on redirecting the research and technology for military projects toward civilian-type projects, on commercialization of these projects, and on further development of cooperation with foreign space programs and initiation of new cooperative projects. I.S.

A92-51805
ERECTION AND WELDING OF LARGE-SIZED STRUCTURES IN SPACE
A. R. BULATTSEV, M. M. MOREINIS, S. A. SKOROBOGATOV, V. I. MOTRY, V. N. SAMILOV, and D. V. BELETSKII (Ukrainian Academy of Sciences, Institute of Electrical Welding, Kiev, Ukraine) IN: Welding in space and the construction of space vehicles by welding; Proceedings of the Conference, New Carrollton, MD, Sept. 24-26, 1991 1991 11 p refs
Copyright

The paper deals with the construction requirements of large structures. It is shown that, depending upon their purpose, different technical solutions concerning architectural appearance, methods of assembly and erection can be found. Description and brief technical characteristics of several types of large-sized truss and shell structures optimized for assembling in space are presented, and the equipment and procedures of assembly and permanent joining of the structures in space are described. Author

A92-51810
STATE-OF-ART AND PROSPECTS OF DEVELOPMENT OF ELECTRON BEAM WELDING OF AEROSPACE VEHICLES
V. A. KAZAKOV (NPO Tekhnomash, Moscow, Russia) and O. K. NAZARENKO (Ukrainian Academy of Sciences, Institute of Electrical Welding, Kiev, Ukraine) IN: Welding in space and the construction of space vehicles by welding; Proceedings of the Conference, New Carrollton, MD, Sept. 24-26, 1991 1991 10 p refs
Copyright

The paper presents information about industrial application of technological processes of electron beam welding EBW of aerospace objects. The characteristics of advanced equipment are given for welding electron guns, power sources, and control systems. Different types of EBW equipment of chamber-type, with a local and mobile evacuation of welding zone, are described. Author

A92-51823
PREDICTION OF STRUCTURAL MATERIALS PERFORMANCE AT LONG-TERM SERVICE IN SPACE CONDITIONS
S. V. BAKUSHIN, D. L. DEMIDOV, IU. D. MOROZOV (Ukrainian Academy of Sciences, Institute of Electrical Welding, Kiev, Ukraine), V. P. NIKITSKII, and I. V. CHURILO (NPO Energiia, Moscow, Russia) IN: Welding in space and the construction of space vehicles by welding; Proceedings of the Conference, New Carrollton, MD, Sept. 24-26, 1991 1991 8 p refs
Copyright

An evaluation is made of the factors affecting the performance of materials with weld-jointed structures in the orbital environment. Internal factors familiar from terrestrial applications encompass impurities and material inhomogeneities, property anisotropies, and dislocation densities; external factors unique to the space environment are one-sided cyclic heating, Em radiation, upper-atmosphere corrosion, and particle impacts. These factors can result in mechanical stresses, chemical and electrochemical corrosion, microcracking, outgassing, and phase transitions. O.C.

A92-52275
THE NEW CHALLENGE FOR SPACE IN RUSSIA
MIKHAIL IA. MAROV (Russian Academy of Sciences, Institute of Applied Mathematics, Moscow, Russia) Space Policy (ISSN 0265-9646), vol. 8, no. 3, Aug. 1992, p. 269-279. Aug. 1992 11 p refs
Copyright

The past, present, and future of the space activities in the former USSR is discussed with particular attention given to a space program for the Commonwealth of Independent States and a Russian Space Agency. The author, who is a senior Russian scientist, emphasizes the need to take advantage of new opportunities for cooperation, argues for the lifting of U.S. restrictions on technology transfer, and stresses the importance of space technology in monitoring environmental problems. O.G.

A92-55565
THE FORMING OF THE COSMIC SYSTEM FOR ECOLOGICAL CONTROL AND ENVIRONMENT OBSERVATION
V. V. MALYSHEV, G. G. ADZHIMAMUDOV, V. E. RUZHITSKII, and A. A. FEDULOV IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 14 p. Aug. 1992 14 p
(IAF PAPER 92-0075) Copyright
A possible technical concept for a satellite-based system of ecological monitoring is described. The determination of the structure of the system, its functions, and the value of the main parameters of its parts is considered. The orbital parameters of the satellites and of the observing apparatus are addressed.
C.D.

A92-55725
'ASTP': MULTINATIONAL COOPERATION - A PERSPECTIVE OVERVIEW
V. A. TIMCHENKO (NPO Energiia, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 11 p. Aug. 1992 11 p
(IAF PAPER 92-0295) Copyright
A review is presented of the experimental Apollo/Soyuz test project (ASTP) mission experience as a good example of international cooperation in space exploration. The ASTP experience has shown that international cooperation requires that constant attention be given to technical solutions and to the coordination of joint activities. To avoid the effects of differences in languages and national technologies, each side should utilize its national standards and technologies with joint solutions made for interfaces. R.E.P.

A92-57182
TSIOLKOVSKY SPACE COMPLEX FOR THE SUN AND OUTER PLANETS OF THE SOLAR SYSTEM EXPLORATIONS
IU. A. RYZHOV, V. M. KOVTUNENKO, V. V. MALYSHEV, N. A. MOROZOV, and V. E. USACHOV (Moscow Aviation Institute; Lavochkin Association, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 9 p. Aug. 1992 9 p refs
(IAF PAPER 92-0767) Copyright
The design concept of a new generation space vehicle, the Tsiolkovsky space complex, is discussed with special attention given to the basic demands of the spacecraft and its systems. These include an operational lifetime of 5 to 7 years; autonomous functioning of all on-board systems and stable long-range radio communication with the earth; energy supply based on fully autonomous radioisotope electric current generators; and rotary and trajectory control systems based on new high-accuracy algorithms of navigation and control, using radiation-resistant instruments consuming little power. For a mission to the sun, the solar probe scientific and housekeeping systems operating in superextreme thermal conditions must be provided. The trade-off analysis of the possible ballistic schemes of the Tsiolkovsky mission to the sun determined the basic scheme permitting perturbation maneuvers in the Jupiter gravitational field. I.S.

N92-11032# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: SPACE. FEOKTISTOV'S VIEWS ON FUTURE DIRECTIONS FOR SPACE PROGRAM
K. P. FEOKTISTOV 1 Oct. 1991 27 p Transl. into ENGLISH of Novoye v Zhizni, Nauke, Tekhnike: Seriya Kosmonavtika, Astronomiya (Moscow, USSR, Izdatelstvo Znaniye), no. 4, Apr. 1991 p 1-63
(JPRS-USP-91-005) Avail: CASI HC A03/MF A01
What has been done so far and what may lie ahead according to the thoughts of Feoktistov is presented. This is something of a summary of the development of the U.S.S.R. space program. An attempt is made to predict how it will develop. The author is one of the first Russian cosmonauts. Author

N92-13081# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: SPACE
30 Jul. 1990 71 p Transl. into ENGLISH of various Russian articles
(JPRS-USP-90-003) Avail: CASI HC A04/MF A01
Space research in the U.S.S.R. is discussed. Topics covered include manned mission highlights, space sciences, interplanetary sciences, space engineering, space applications, and space policy.

N92-14068# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: SPACE. MISHIN MONOGRAPH ON FAILURE OF SOVIET MANNED LUNAR PROGRAM
V. P. MISHIN 12 Nov. 1991 21 p Transl. into ENGLISH of Novoye v Zhizni, Nauke, Tekhnike: Seriya Kosmonavtika, Astronomiya (USSR), no. 12, 1990 p 1-19
(JPRS-USP-91-006) Avail: CASI HC A03/MF A01
This translation of a Russian monograph is by a chief designer of the Soviet Space program who tries to answer many questions as to why the U.S.S.R. failed in its manned lunar program and why it failed to do so before the U.S. He, the author, concludes that (1) the U.S. at that time possessed higher scientific-technical and economic potentials than the Soviets; (2) in the U.S., the Apollo/Saturn program was a national, first priority program that was supposed to restore the country's prestige; (3) bewitched by their success in space, they underated the challenge issued by President Kennedy in 1961; and (4) they underestimated the scientific and technical difficulties of accomplishing such a mission. E.R.

N92-23705# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: SPACE
1 Apr. 1992 59 p Transl. into ENGLISH from various Russian articles
(JPRS-USP-92-002) Avail: CASI HC A04/MF A01
A bibliography is given of Central Eurasian research in space sciences. Topics covered include solar sails, satellite motion prediction, magnetic storms, the Earth radiation belt, magnetic field vector measurement from a rotating spacecraft, the formation of planetary systems in the course of the evolution of close binary stars, and estimating the mass of Halley's Comet dust particles.
Author

N92-24745*# European Space Agency. European Space Operations Center, Darmstadt (Germany). Mission Analysis Section.
REVIEW OF ESOC RE-ENTRY PREDICTION RESULTS OF SALYUT-7/KOSMOS-1686
H. KLINKRAD *In its* Spacecraft Flight Dynamics p 181-200 Dec. 1991 Sponsored by NASA. Johnson Space Center; NASA. Goddard Space Flight Center; Academy of Sciences; Ministry of Defence; USSR Mission Control; Research Establishment for Applied Science; RAE; CNR; and CNES/CST
Copyright Avail: CASI HC A03/MF A06; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 90 Dutch guilders
An overview of activities at ESA/ESOC during the followup of the Salyut-7/Kosmos-1686 decay, and of related cooperations with space agencies, research institutes, and national bodies within the ESA Member States, within the U.S. and within the USSR, is presented. A postflight analysis indicated areas for improvement in the forecast procedures, especially during the last day of the orbital lifetime. Corresponding revised decay predictions are

presented for Salyut-7/Kosmos-1686, and the improved procedures are verified by an analysis of the reentries of Kosmos-1402A and Kosmos-1402C. ESA

N92-24775# Glavkosmos, Moscow (USSR). Mission Control Center.
SOVIET PROSPECTIVE SPACE PROJECTS AND THE MAIN BRANCHES OF THE FUNDAMENTAL AND APPLIED RESEARCH IN THE FIELD OF ASTRODYNAMICS AND SPACECRAFT NAVIGATION
V. N. POCHUKAEV and V. F. TIKHONOV *In* ESA, Spacecraft Flight Dynamics p 405-412 Dec. 1991
Copyright Avail: CASI HC A02/MF A06; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 90 Dutch guilders

A number of Soviet projects developed according to the indicated trends with realization dates up to the year 2000 are summarized. The following main parts are highlighted: scientific space projects; space navigation, geodesy and geodynamics; remote probing of the Earth; medical and biological research; space communication and television; space technology; manned complexes. ESA

N92-24779# Academy of Sciences (USSR), Moscow. Inst. of Space Research.
LUNAR SWINGBY AS A TOOL FOR HALO-ORBIT OPTIMIZATION IN RELICT-2 PROJECT
NATAN EISMONT (Moscow Inst. of Aviation Technology (USSR).), DAVID DUNHAM (Computer Sciences Corp., Lanham, MD.), SHAO-CHENG JEN (Computer Sciences Corp., Lanham, MD.), and ROBERT FARQUHAR (Johns Hopkins Univ., Laurel, MD.) *In* ESA, Spacecraft Flight Dynamics p 435-439 Dec. 1991
Copyright Avail: CASI HC A01/MF A06; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 90 Dutch guilders

The Relict-2 project for astrophysical experiments and for exploration of distance regions of the Earth's magnetotail is addressed. A Prognoz type spacecraft, which has a rather limited delta V capability, will be used. A lunar swingby is proposed in order to reach the desired orbit in the vicinity of the solar-terrestrial L2 libration point. Such a technique requires diminishing the amplitude of the halo orbit around L2 to the desired values and optimizing the orbit for planned experiments. The possibilities for realizing such orbits, taking into account technical restrictions imposed by the spacecraft motion control systems, are investigated. Achievable launch windows are determined for different amplitude halo orbits. Trajectories completed two, three, and four revolutions before the lunar swingby are analyzed. ESA

N92-24780# Academy of Sciences (USSR), Moscow. Inst. of Space Research.
OPTIMIZATION OF DOUBLE SWINGBYS
A. A. SUKHANOV *In* ESA, Spacecraft Flight Dynamics p 441-447 Dec. 1991
Copyright Avail: CASI HC A02/MF A06; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 90 Dutch guilders

Interplanetary flights in which a spacecraft performs two swingbys about a planet are considered. The spacecraft trajectory before and after the double swingby is assumed to be given. The transfer between the swingbys is assumed to be free, and during each swingby active maneuvers are allowed. Requirements that the transfer should satisfy are determined. In cases when the transfer orbit is not unique, the way of its optimization (i.e., minimization of total delta V) is shown. ESA

N92-25333# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: SPACE
20 Sep. 1991 94 p Transl. into ENGLISH from various Russian articles
(JPRS-USP-91-004) Avail: CASI HC A05/MF A01

A bibliography of USSR space science and technology is given. Topics covered include manned mission highlights, spaceborne astronomy, space engineering, space applications, and space policy and administration. Author

N92-27931# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: SPACE
27 Jan. 1992 76 p Transl. into ENGLISH from various Central Eurasian articles
(JPRS-USP-92-001) Avail: CASI HC A05/MF A01

Several topics relative to Central Eurasian space science activities are discussed. Topics covered include a gamma ray telescope on an earth orbiting satellite, satellite launches, spacecraft control, electron diffusion in the Earth radiation belt, charged particle fluxes in the magnetosphere, orbital solar electric power stations, space policy, and the MAKS air launched spaceplane.

N92-33007*# National Aeronautics and Space Administration, Washington, DC.
TOWARD THE NEXT MILLENNIUM: A VISION FOR SPACESHIP EARTH
DANIEL S. GOLDIN 1992 7 p Presented at the World Space Congress, 2 Sep. 1992
(NASA-TM-107986; NAS 1.15:107986) Avail: CASI HC A02/MF A01

The transcript of NASA Administrator Daniel S. Goldin's address to the World Space Congress is presented. The address discusses the current international flavor of space exploration, especially in the context of cooperative ventures with the former Soviet Union, and establishes the need for a return to the Moon. Goldin's speech emphasizes that returning to the moon is only the beginning of a program of exploration that will lead to human investigation of Mars, the rest of the solar system, and beyond. By following this program to its logical conclusion, human beings will eventually establish themselves as a multi-planetary species. D.R.D.

13

ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbital and launching dynamics.

A92-12811
OPTIMAL LAUNCH OF A SPACECRAFT FROM THE LUNAR SURFACE INTO CIRCULAR LUNAR ORBIT [OPTIMAL'NOE VYVEDENIE KOSMICHESKOGO APPARATA S POVERKHNOSTI LUNY NA KRUGOVUIU ORBITU EE SPUTNIKA]
K. G. GRIGOR'EV, M. P. ZAPLETIN, and D. A. SILAEV Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 29, Sept.-Oct. 1991, p. 695-704. In Russian. Oct. 1991 10 p In RUSSIAN refs
Copyright

The paper presents results of a numerical solution for the optimal injection of a spacecraft from the lunar surface into a circular lunar orbit. The functions that are controlled are the direction and magnitude of the rocket thrust; the spacecraft is equipped with a high thrust engine. The functional that is minimized represents a tradeoff between the orbital injection time and the mass expenditure. The problem is solved using the maximum principle. Optimal trajectories are calculated in a wide range of orbit altitudes, thrust-to-weight ratios, and net specific thrusts. L.M.

A92-18220
OBSERVABILITY OF THE INITIAL CONDITIONS OF SATELLITE MOTION ACCORDING TO THE ORIENTING ANGLES OF THE SPACE PHOTOGRAPHY BASES [O NABLIUDAEMOSTI NACHAL'NYKH USLOVII DVIZHENIIA ISZ PO ORIENTIRUIUSHCHIM UGLAM BAZISOV KOSMICHESKOI S'EMKI]
T. K. DEDOVA Geodeziia i Aerofotos'emka (ISSN 0536-101X),

no. 6, 1990, p. 59-67. In Russian. 1990 9 p In RUSSIAN refs
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The paper examines the observability of the initial values of Keplerian-orbit elements according to the photogrammetric processing of simultaneous overlapping photographs of the earth's surface using internal geometric relationships. It is shown that the initial values of all six elements of the Keplerian orbit can be determined uniquely using the orienting angles of the space photography bases. L.M.

A92-18348
THE PROBLEM OF SPACECRAFT DOCKING IN ELLIPTICAL ORBIT [K ZADACHE O STYKOVKE KOSMICHESKIKH APPARATOV NA ELLIPTICHESKOI ORBITE]
V. I. POPADINETS, V. S. BURLAKA, A. V. ISHCHENKO, and I. G. TSEN'KUSH (AN USSR, Institut Kibernetiki, Kiev, Ukrainian SSR) Prikladnaia Mekhanika (ISSN 0032-8243), vol. 27, Oct. 1991, p. 105-112. In Russian. Oct. 1991 8 p In RUSSIAN refs
Copyright

A general mathematical model is proposed for the docking of spacecraft in elliptical orbit. The system of the docked spacecraft is treated as a discrete system whose motion is described by ordinary differential equations. The accuracy of the model is evaluated. V.L.

A92-21639
MOTION OF A SATELLITE WITH FLEXIBLE VISCOELASTIC BOOMS IN A NONCENTRAL GRAVITATIONAL FIELD [DVIZHENIE SPUTNIKA S GIBKIMI VIAZKOUPRUGIMI STERZHNIAMI V NETSENTRAL'NOM POLE TIAGOTENIIA]
A. V. SHATINA Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 29, Nov.-Dec. 1991, p. 815-821. In Russian. Dec. 1991 7 p In RUSSIAN refs
Copyright

The motion of an artificial satellite having the form of a plane disk with rigid and viscoelastic booms in the gravitational field of an asymmetric planet is investigated. The equations of satellite motion are derived by means of averaging in Delaunay's canonical variables. L.M.

A92-21640
MOTIONS OF A SATELLITE THAT ARE ASYMPTOTIC WITH RESPECT TO ITS REGULAR PRECESSIONS [O DVIZHENIIAKH SPUTNIKA, ASIMPTOTICHESKIKH K EGO REGULIARNYM PRETSESSIIAM]
B. S. BARDIN Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 29, Nov.-Dec. 1991, p. 822-827. In Russian. Dec. 1991 6 p In RUSSIAN refs
Copyright

The problem of solutions asymptotic with respect to the equilibrium position of an autonomous Hamiltonian system with two degrees of freedom in the case of second-order resonance is investigated using the methods of Markeev and Shcherbina (1987, 1990). Necessary and sufficient conditions of existence and an approximate analytical representation of the asymptotic solutions are found. The results obtained are applied to the problem of the motions of a dynamically symmetric satellite that are asymptotic with respect to its regular precessions in a circular orbit. L.M.

A92-21646
GENERATION OF PASSIVE FLYBY TRAJECTORIES AND CHOICE OF ROUTES IN RELATION TO CELESTIAL BODIES MOVING IN KEPLERIAN ORBITS [POSTROENIE TRAEKTORII I VYBOR MARSHRUTOV PASSIVNOGO PROLETA GRUPP NEBESNYKH TEL, DVIZHUSHCHIKHSIA PO KEPLEROVSKIM ORBITAM]
M. IU. AKHLEBININSKII and M. S. KONSTANTINOV Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 29, Nov.-Dec. 1991, p. 889-904. In Russian. Dec. 1991 16 p In RUSSIAN refs
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A new approach to the problem of generating multiple flyby trajectories is described. A theorem of the existence of a flyby orbit for three bodies moving in circular orbits with the same radius is formulated and proved, and the question of the uniqueness of these orbits is analyzed. In addition, an effective numerical method is proposed for generating the flyby orbits for three bodies moving in arbitrary elliptical orbits. Examples are discussed which illustrate the capabilities of the proposed approach. L.M.

A92-21687
FUNDAMENTALS OF SPACE FLIGHT MECHANICS [OSNOVY MEKHANIKI KOSMICHESKOGO POLETA]
DMITRII E. OKHOTSIMSKII and IURII G. SIKHARULIDZE (AN SSSR, Institut Prikladnoi Matematiki, Moscow, USSR) Moscow, Izdatel'stvo Nauka, 1990, 448 p. In Russian. 1990 448 p In RUSSIAN refs
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The fundamental principles of space flight mechanics are presented with emphasis on practical applications. The discussion covers problems in gravitation theory; the classical two-body problem and its applications to practical ballistics and optimal transfers between various types of orbits; and the libration point theory. Attention is also given to perturbed motions, estimation of the satellite life, and satellite orbit evolution under the effect of a noncentral gravitational field and an external perturbing body. V.L.

A92-23583
INVESTIGATION OF THE TRANSFER TRAJECTORY TO THE HALO ORBIT NEAR THE L2 LIBRATION POINT IN THE EARTH-SUN SYSTEM USING THE MOON'S GRAVITY [ISSLEDOVANIE TRAEKTORII POLETA NA GALO-ORBITU V OKRESTNOSTI TOCHKI LIBRATSII L2 SISTEMY ZEMLIA-SOLNTSE S ISPOL'ZOVANIEM GRAVITATSII LUNY]
M. L. LIDOV, V. A. LIAKHOVA, and N. M. TESLENKO (AN SSSR, Institut Prikladnoi Matematiki, Moscow, USSR) Pis'ma v Astronomicheskii Zhurnal (ISSN 0320-0108), vol. 17, Dec. 1991, p. 1124-1134. In Russian. Dec. 1991 11 p In RUSSIAN refs
Copyright

The mission scheme for transfer to the halo orbit in the earth-sun system proposed by Farquhar (1991) is studied in connection with the Relikt-2 project. According to this scheme, a spacecraft performs two preliminary revolutions along a high-eccentricity orbit. The orbit parameters are chosen so as to provide a close encounter with the moon at the first half-orbiting during the third revolution. As a result, the spacecraft would enter an orbit asymptotically approaching the halo orbit near L2. The moon's gravity effect allows the spacecraft to reach the halo orbit with much smaller dimensions than in the case of direct transfer. A preliminary analysis of approximate trajectories in 1994 is presented. P.D.

A92-27648
SPACECRAFT TRAJECTORIES WITH GRAVITATIONAL MANEUVERS [TRAEKTORII KA S GRAVITATSIONNYMI MANEVRAMI]
L. L. SOKOLOV and V. B. TITOV Leningradskii Universitet, Vestnik, Matematika, Mekhanika, Astronomiia (ISSN 0024-0850), July 1991, p. 111-114. In Russian. Jul. 1991 4 p In RUSSIAN refs
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A method for constructing spacecraft trajectories with gravitational maneuvers is presented. Examples of trajectories with close encounters with Venus and the earth, or going beyond Jupiter, are constructed. A program complex operating in the interactive mode was used to select and construct the required trajectories. L.M.

A92-30174
THE USE OF THE 'ADJACENT EXTREMALS' METHOD TO CONTROL THE TRAJECTORY MOTION OF A SPACE VEHICLE ENTERING A CIRCULAR ORBIT [ISPOL'ZOVANIE METODA 'SOSEDNIKH EKSTREMALEI' DLIA UPRAVLENIIA TRAEKTORNYM DVIZHENIEM KOSMICHESKOGO LETATEL'NOGO APPARATA PRI VYVEDENII NA KRUGOVUIU ORBITU]
A. I. FEDOROV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 4, 1990, p. 33-41. In Russian. 1990 9 p In RUSSIAN refs
Copyright
An algorithm for the suboptimal control of the trajectory of a space vehicle entering a circular orbit is developed on the basis of the adjacent extremals theory, which takes into account the requirement of not only maintaining the control accuracy but also of minimizing fuel consumption. The suboptimal algorithm is shown to assure the precision of the trajectory control in the presence of a wide range of initial disturbances of the phase coordinates. The difference between the suboptimal control obtained using this algorithm and the optimal control was found to be insignificant. I.S.

A92-33735
SOLUTIONS OF THE THREE-BODY PROBLEM AND RANDOM PROCESSES [RESHENIIA ZADACHI TREKH TEL I SLUCHAINYE PROTSESSY]
L. L. SOKOLOV Leningradskii Universitet, Vestnik, Matematika, Mekhanika, Astronomiia (ISSN 0024-0850), Oct. 1991, p. 30-38. In Russian. Oct. 1991 9 p In RUSSIAN refs
Copyright
The paper examines the stochastic properties of motions in the plane circular restricted three-body problem involving the sun, a planet, and a spacecraft, associated with instability in connection with close approaches. The method of point spheres of action is used to obtain a simple clear scheme and to isolate motions with the necessary properties. Gravitational maneuvers of spacecraft in spheres of planetary action are examined. L.M.

A92-40651
PHASE CONSTRAINTS IN THE PROBLEM OF ESTIMATION WITH UNMODELED DISTURBANCES [O FAZOVYKH OGRANICHENIIAKH V ZADACHE OTSENIVANIIA S NEMODELIRUEMYMI VOZMUSHCHENIIAMI]
A. I. MATASOV Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 30, no. 1, Jan.-Feb. 1992, p. 3-9. In Russian. Feb. 1992 7 p In RUSSIAN refs
Copyright
It is noted that many problems of spacecraft-orbit determination are reducible to the estimation problem with unmodeled disturbances. In some cases it is necessary to allow for additional constraints for the derivatives of these disturbances, which generate phase constraints in the equivalent estimation problem. It is shown that in the problem under consideration that the presence of the phase constraints is equivalent to additional measurements. L.M.

A92-40655
DETERMINATION OF SATELLITE ORBIT PARAMETERS VIA MEASUREMENTS OF THE ANGULAR POSITION OF THE SATELLITE FROM AN ORBITAL SPACECRAFT [OPREDELENIE PARAMETROV ORBITY ISZ PO IZMERENIIAM EGO UGLOVOGO POLOZHENIIA S ORBITAL'NOGO KOSMICHESKOGO APPARATA]
A. I. DAUGAVET and E. V. POSTNIKOV Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 30, no. 1, Jan.-Feb. 1992, p. 45-51. In Russian. Feb. 1992 7 p In RUSSIAN
Copyright
A method is proposed for determining the orbit parameters of an earth satellite using angular measurements from a spacecraft that has known orbit and attitude parameters. It is noted that this method is suitable for the case of short-duration observations. Formulas for calculating the rms errors associated with the parameters estimated are presented. L.M.

A92-44069
DETERMINING THE COORDINATES OF SPACECRAFT USING RADIO INTERFEROMETRY [OPREDELENIE KOORDINAT ISKUSSTVENNYKH KOSMICHESKIKH OB'EKTOV METODOM RADIOINTERFEROMETRII]
G. A. SHANUROV (Moskovskii Institut Inzhenerov Geodezii, Aerofotos'emki i Kartografii, Moscow, Russia) Geodeziia i Aerofotos'emka (ISSN 0536-101X), no. 5, 1991, p. 25-30. In Russian. 1991 6 p In RUSSIAN refs
Copyright

A92-44128
RELATIONSHIP BETWEEN THE CHARACTERISTIC VELOCITY AND THE TIME OF OPTIMAL TWO-IMPULSE TRANSFERS BETWEEN CIRCULAR ORBITS [ZAVISIMOST' MEZHDU KHARAKTERISTICHESKOI SKOROST'IU I DLITEL'NOST'IU OPTIMAL'NYKH DVUKHIMPUL'SNYKH PERELETOV MEZHDU KRUGOVYMI ORBITAMI]
A. N. BOBKOVA and S. N. KIRPICHNIKOV Sankt-Peterburgskii Universitet, Vestnik, Seriia 1 - Matematika, Mekhanika, Astronomiia (ISSN 0024-0850), no. 1, Jan. 1992, p. 55-60. In Russian. Jan. 1992 6 p In RUSSIAN refs
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The problem of the optimization of a two-impulse transfer between circular orbits in a central Newtonian gravitational field is examined with emphasis on the relationship between the characteristic velocity and the time of the transfer. The cases of coplanar and noncoplanar boundary orbits are considered. A method for determining the characteristic velocity-time relation is proposed, and graphical representations of these relations are analyzed. It is shown that the optimal time of a two-impulse transfer is a continuous monotonically decreasing function of the specified characteristic velocity. V.L.

A92-46738
OPTIMIZATION OF LOW-ALTITUDE GLOBAL COMMUNICATION CONSTELLATIONS
ALEKSANDR A. GUTENEV (Dniprchermetavtomatika, Dnepropetrovsk, Ukraine) Journal of Guidance, Control, and Dynamics (ISSN 0731-5090), vol. 15, no. 4, July-Aug. 1992, p. 871-877. Aug. 1992 7 p refs
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The problem of optimizing the orbital structure of multisatellite networks designed to transfer information globally is considered. A new criterion, the number of independent intersatellite cross-link paths between any pair of satellites in the constellation, is proposed. A problem of orbital pattern structure optimization is formulated. A numerical solution algorithm is described. Results of the problem solution in the set of kinematically regular networks are given. An estimation of the maximum possible number of independent intersatellite cross-link paths is proposed. Comparisons of calculation results and estimation show high performance of kinematically regular constellations. Author

A92-52737
OSCILLATIONS OF LIGHT TETHERED SATELLITES IN A NON-STATIONARY AND ROTATING ATMOSPHERE
VLADIMIR ZHUK and EVGENII SHAKHOV (Russian Academy of Sciences, Computing Center, Moscow, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 8 p refs
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Spherical oscillations of a satellite of small mass tethered to orbiter by noninertial, nonelastic, and flexible thread are studied. The oscillations at low orbit are mainly caused by aerodynamic drag and gravity. In the paper, the oscillations are considered as desirable motions because they may provide some new possibilities for geophysical researches. The period of the oscillations is a single-valued function of the aerodynamic drag at the altitude of

flight. The orbiter is assumed to move in a circular orbit. The mathematical model takes into account both daily variations of the atmosphere density and the atmosphere rotation. Author

A92-53544
ON SOME SPECIFIC FEATURES OF DYNAMICS OF ORBITAL TETHER SYSTEMS
V. SARYCHEV, IU. SADOV, and A. PETROV (Rossiiskaia Akademiia Nauk, Institut Prikladnoi Matematiki, Moscow, Russia) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 1 1990 6 p
Copyright

The motion of multicomponent structures with variable configurations is analyzed. It is shown that, for nongravitational perturbations, and additional perturbing acceleration of the orbital coordinate system must be taken into consideration in the equations of relative motion even if it can be ignored in the orbital motion equation. This fact is illustrated for a tether system with a flexible weightless tether and air drag. It is shown that, even with a constant atmospheric density, such a system may have one to five equilibrium configurations in the orbital coordinates. If the amplitude of initial deviations of the tether from the vertical stable position in the central gravitational field exceeds a certain value, then nonlinear effects play an essential role. These manifest themselves in the excitation of high vibration modes, the appearance of tension peaks, and the stochastic nature of vibrations. C.D.

A92-53851
DETERMINATION OF THE ACTUAL MOTION OF THE SALYUT-7 - COSMOS-1686 ORBITAL COMPLEX RELATIVE TO THE CENTER OF MASS IN HIGH ORBIT [OPREDELENIE FAKTICHESKOGO DVIZHENIIA ORBITAL'NOGO KOMPLEKSA 'SALIUT-7' - KOSMOS-1686' OTNOSITEL'NO TSENTRA MASS NA VYSOKOI ORBITE]
V. A. SARYCHEV, V. V. SAZONOV, M. IU. BELIAEV, N. I. EFIMOV, I. L. LAPSHINA, and V. M. STAZHKOV Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 30, no. 2, Mar.-Apr. 1992, p. 147-156. In Russian. Apr. 1992 10 p In RUSSIAN refs
Copyright

Dynamic effects due to the gravitational one-axis stabilization of the Salyut-7 - Cosmos-1686 orbital complex are described. The effects were discovered as a result of statistical data processing of on-board measurements of the solar and magnetic sensors. The motion of the orbital complex around the center of mass at various times is illustrated. P.D.

A92-53853
RENDEZVOUS OF LOW-THRUST SPACECRAFT IN A NEAR-CIRCULAR ORBIT [SBLIZHENIE KOSMICHESKIKH APPARATOV S MALOI TIAGOI NA OKOLOKRUGOVYKH ORBITAKH]
S. A. ISHKOV Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 30, no. 2, Mar.-Apr. 1992, p. 165-179. In Russian. Apr. 1992 15 p In RUSSIAN refs
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The problem of the rendezvous of low-thrust spacecraft in near-circular orbits is considered. A simplified model of motion is derived on the basis of motion equations linearized by the selection of slowly changing and periodic components. The general problem is divided into individual ones, namely, control of transversal and longitudinal motion and control of slowly changing and periodic components. A number of local optimal control programs for the transversal and free orientation of the thrust vector are obtained as a speed-of-response criterion. The efficiency of the control programs obtained is evaluated. P.D.

A92-53854
ESTIMATED OPTIMUM CONTROL OF A SPACECRAFT BY THE ROCKET ENGINE THRUST VECTOR AT THE EXTRAATMOSPHERIC SECTION OF THE REENTRY OF AN ARTIFICIAL EARTH SATELLITE [PRIBLIZHENNO-OPTIMAL'NOE UPRAVLENIE KA VEKTOROM TIAGI DVIGATEL'NOI USTANOVKI NA VNEATMOSFERNOM UCHASTKE SPUSKA S ORBITY ISZ]
N. L. SOKOLOV, A. P. SOKOLOV, and T. IU. SMIRNOVA Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 30, no. 2, Mar.-Apr. 1992, p. 180-193. In Russian. Apr. 1992 14 p In RUSSIAN refs
Copyright

The paper investigates optimal, minimum-fuel control of a spacecraft by the rocket engine thrust vector on the extraatmospheric section of the reentry of a satellite. The control design, which provides for firing of the engine twice, is shown to be highly efficient. A high-speed algorithm is developed for calculating the estimated optimum reentry trajectories to the prescribed area of the earth surface. P.D.

A92-53855
TRAJECTORY OPTIMIZATION FOR SPACE FLIGHTS FROM EARTH TO MARS USING SOLAR SAILS [OPTIMIZATSIIA TRAEKTORII PERELETA KOSMICHESKOGO APPARATA S SOLNECHNYM PARUSOM OT ZEMLI K MARSU]
B. IA. SAPUNKOV, V. A. EGOROV, and V. V. SAZONOV Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 30, no. 2, Mar.-Apr. 1992, p. 194-202. In Russian. Apr. 1992 9 p In RUSSIAN refs
Copyright

Time-optimal trajectories of space flights from the earth's sphere of action to the Martian action sphere are found. The spheres of action are assumed to be point-size, i.e., the initial and final states of a spacecraft and the corresponding positions of planets are the same. The initial velocity of a spacecraft is equal to the earth's velocity. The velocities of a spacecraft and Mars at the final point are not equalized. The earth and Martian orbits are assumed to be coplanar, and the trajectories of a spacecraft lie in their planes. The sail is flat. It is assumed that the epsilon fraction of photons is spectrally reflected by the sail, and other photons are absorbed. Time-optimal trajectories are found as a result of solving Pontryagin's boundary problem. A family of solutions is constructed by the 'shooting' method for epsilon = 1 and epsilon = 1.8. The solutions of this family depend smoothly on the initial value of the angle between Mars and the earth. P.D.

A92-53856
THE OPTIMAL SOFT LANDING OF A SPACECRAFT ON THE LUNAR SURFACE FROM THE LUNAR SATELLITE CIRCULAR ORBIT [OPTIMAL'NAIA MIAGKAIA POSADKA KOSMICHESKOGO APPARATA NA POVERKHNOST' LUNY S KRUGOVOI ORBITY EE SPUTNIKA]
K. G. GRIGOR'EV, E. V. ZAPLETINA, and M. P. ZAPLETIN Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 30, no. 2, Mar.-Apr. 1992, p. 203-211. In Russian. Apr. 1992 9 p In RUSSIAN refs
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Results are presented of a numerical solution, based on the maximum principle, of the problem of the optimal soft landing of a spacecraft with a high-thrust rocket engine from the lunar satellite circular orbit to the lunar surface in its central Newtonian gravitational field with thrust vector control. The functional, which represents a tradeoff between landing time and mass expenditures, is minimized. The 'shooting' method is used to obtain an exact numerical solution to the corresponding maximum principle boundary problems. Calculations of optimal trajectories of a soft landing are carried out in a wide range of orbit heights, net specific thrusts, thrust-to-weight ratios, and tradeoff coefficients. It is shown that in the problem of the fastest soft landing in the absence of a restriction on final mass, the thrust is maximum and is generated continuously; however, with the growth of the effect in the functional

of the component linked with mass expenditures, a bifurcation of the flight sector with maximum thrust occurs. P.D.

A92-53864
PARAMETRIC OSCILLATIONS OF A DEFORMABLE SPACECRAFT [O PARAMETRICHESKIKH KOLEBANIIAKH DEFORMIRUEMOGO KOSMICHESKOGO APPARATA]
I. V. SKOROBOGATYKH Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 30, no. 2, Mar.-Apr. 1992, p. 275-278. In Russian. Apr. 1992 4 p In RUSSIAN refs
Copyright

A theoretical analysis of the parametric oscillations of a deformable spacecraft is presented. The spacecraft is represented as a dynamically symmetric mechanical system consisting of an elastic part and a rigid part. The elastic part is subjected to a pulsating load. L.M.

A92-55520
OPTIMIZATION OF SPACECRAFT ASCENT USING AERODYNAMIC FORCES
A. S. FILAT'EV (Central Aerohydrodynamic Institute, Zhukovski, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 12 p. Aug. 1992 12 p refs
(IAF PAPER 92-0022) Copyright

A study on the optimization of spacecraft ascent in atmosphere based on Pontryagin's (1969) maximum principle is discussed. New qualitative phenomena in optimal ascent due to aerodynamic forces, including bifurcation, are described. The efficiency of the procedures developed and the applied package ASTER is demonstrated for the practical investigation of future spacecraft transport systems. R.E.P.

14

GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

A92-36155
AN INDUCTION PLASMA APPLICATION TO 'BURAN'S' HEAT PROTECTION TILES GROUND TESTS
A. N. GORDEEV, A. F. KOLESNIKOV, and M. I. IAKUSHIN (Russian Academy of Sciences, Institute for Problems in Mechanics, Moscow, Russia) SAMPE Journal (ISSN 0091-1062), vol. 28, no. 3, May-June 1992, p. 29-33. Jun. 1992 5 p refs
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Induction-plasmotron plasma generators of chemically pure, highly stable gas jets, with excellent reproducibility of jet parameters, are noted to be ideal bases for real-time tests that can generate data for hypersonic vehicle thermal protection materials' response to reentry thermochemistry. Attention is presently given to the use of Russia's VGU-3 facility for the dissociated-air testing of Buran's thermal protection tiles. The combination of accurate high enthalpy subsonic jet diagnostics with heat transfer numerical calculations yielded reliable data on the catalytic activity of tile and carbon-carbon coating surfaces at elevated temperatures and low pressures. O.C.

A92-40464
THE PLASMA LAUNCHERS FOR SPS
B. A. OSADIN (VNII Elektromekhaniki, Moscow, Russia) IN: SPS 91 - Power from space; Proceedings of the 2nd International Symposium, Gif-sur-Yvette, France, Aug. 27-30, 1991 1991 5 p refs

The potential for development of terrestrial electric accelerators for launching solar power satellite components into orbit is discussed. An accelerator that uses anomalous plasma pressure for the projectile acceleration is presented. It is shown that such an accelerator has specific advantages over an accelerator that employs ampere force. R.E.P.

A92-55720
THE EXPERIENCE OF THE GAGARIN COSMONAUTS TRAINING CENTER IN THE FIELD OF INTERNATIONAL COOPERATION
P. I. KLIMUK (Cosmonauts Training Centre, Zvezdny Gorodok, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 5 p. Aug. 1992 5 p
(IAF PAPER 92-0286) Copyright

An overview is presented of the activities conducted at the Gagarin Cosmonauts Training Center focusing on the programs of international cooperation, such as the Apollo/Soyuz mission. During a period of several years, various space missions have been performed in accordance with bilateral agreements reached with different countries, e.g., England, France, Austria, and Germany. Consideration is given to some aspects of cosmonaut training and the training devices employed in this training. R.E.P.

A92-55853
ORGANIZATION OF THE FLIGHT CONTROL CENTRE IN EVPATORIA - BASIC PRINCIPLES
R. S. KREMNEV, K. G. SUKHANOV, O. V. PAPKOV, I. D. TSERENIN, A. I. L'VOV, and IU. K. ZAIKO (Babakin Engineering and Research Centre, Khimki, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 14 p. Aug. 1992 14 p
(IAF PAPER 92-0549) Copyright

The salient features of the organization of the flight control center in Evpatoria (Crimea) are discussed. Consideration is given to the characteristics of spacecraft control, the ground control segment, and the organization of mission operations. The hardware and software complex for telemetry and command transmission is described. Block diagrams of the various phases of flight control operations are presented. I.S.

N92-20789# Moscow Inst. of Aviation Technology (USSR). Mission Control Center.
FORMING OF TECHNICAL STRUCTURE AND SOFTWARE FOR SOVIET MISSION CONTROL CENTER
V. I. LOBACHEV, V. N. POCHUKAEV, V. V. MALYSHEV, and M. N. KRASILSHIKOV *In* ESA, Launch Bases and Control Infrastructures for Spacecraft p 509-514 Oct. 1991
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 90 guilders

The operational structure of the Soviet Mission Control Center (MCC) is considered. The structure of MCC consists of four basic departments: technical (hardware); information-mathematical (software); organizational; and information-reference (data base). The organizational flowcharts of the departments are given. Opportunities and interactions between the different departments are considered. ESA

15

LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles.

A92-12569
THE AN-225/INTERIM HOTOL LAUNCH VEHICLE
V. IA. NEILAND (Tsentral'nyi Aerogidrodinamicheskii Institut, Zhukovski, USSR) and R. C. PARKINSON (British Aerospace Space and Communications, Ltd., Stevenage, England) IAF, International Astronautical Congress, 42nd, Montreal, Canada, Oct. 5-11, 1991.

8 p. Oct. 1991 8 p refs
(IAF PAPER 91-197) Copyright

The use of the Antonov An-225 heavy lift aircraft provides the possibility of launching a (nearly) single-stage vehicle at altitude using conventional rocket propulsion but drawing on the Hotol airframe technology. This paper discusses the performance, orbiter design, An-225 carriage and separation, operations, and economics of this An-225/Interim Hotol Launch Vehicle. C.D.

A92-30139
A METHOD FOR ESTIMATING THE MINIMUM DISTANCE BETWEEN TWO FLIGHT VEHICLES DURING THEIR SEPARATION [METOD OTSENKI NAIMEN'SHEGO RASSTOIANIIA MEZHDU LETATEL'NYMI APPARATAMI V PROTSESSE IKH RAZDELENIIA]
V. A. IL'IN and A. P. LEUTIN TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 107-111. In Russian. 1990 5 p In RUSSIAN refs
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A method is proposed for estimating the minimum distance between two flight vehicles (the carrier and the cargo) that are in the process of separation. For this purpose, the surface areas for which the contact is most probable are approximated by a set of triangular and a set of quadrilateral facets, and the minimum distance between these sets is determined through an exhaustive search. Two methods are proposed for reducing the number of combinations that need to be processed: (1) by examining the elements of both sets in the vicinities of 'dangerous' points (which are few); and (2) by examining only those 'facet-apex' combinations where the outer surface of a facet could be illuminated by light beams emanating from the apex as a source. The efficiencies of these methods are compared. I.S.

A92-31699#
USSR AEROSPACE PLANE PROGRAM
G. I. ZAGAINOV and V. P. PLOKHIKH (Tsentral'nyi Aero-Gidrodinamicheskii Institut, Moscow, Russia) AIAA, International Aerospace Planes Conference, 3rd, Orlando, FL, Dec. 3-5, 1991. 30 p. Dec. 1991 30 p refs
(AIAA PAPER 91-5103) Copyright

The requirements and benefits of a Soviet aerospace plane program are examined by analyzing the available technologies, prospective missions, and ongoing projects. Attention is given to the Burlak spacecraft with the Maks orbiter, the fully reusable AN 225/HOTOL carrier aircraft, and to the orbit/payload analyses of reusable aerospace systems. The primary conclusions of the overview are that international cooperation in space commercialization is important for aerospace plane development and that the optimization of technologies is an initial goal. C.C.S.

A92-40601
ACTIVE BRAKING OF SPACECRAFT IN PLANETARY ATMOSPHERES USING A MODULAR REVERSE-THRUST ENGINE [AKTIVNOE TORMOZHENIE KLA V ATMOSFERAKH PLANET S ISPOL'ZOVANIEM BLOCHNOI TORMOZNOI DVIGATEL'NOI USTANOVKI]
V. T. KALUGIN and A. IU. LUTSENKO Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1991, p. 3-8. In Russian. 1991 6 p In RUSSIAN refs
Copyright

Results of a series of aerodynamic studies of segmented conical landing modules are summarized. In particular, the results demonstrate the advantages of using a reverse-thrust engine with a block of nozzles located at the spacecraft periphery rather than a central engine. They also provide a way to determine possible structures of flow about a spacecraft during active jet-block braking, to determine criteria for the transition from one flow structure to another, and to confirm the corresponding change in the aerodynamic characteristics over the entire thrust coefficient range investigated. V.L.

A92-57244
MULTI-PURPOSED AEROSPACE SYSTEM MAKS AND ITS OUTLOOK
G. E. LOZINO-LOZINSKII, IU. M. KOSINSKII, V. A. SKORODELOV (Research/Production Firm Molniia, Moscow, Russia), and V. P. PLOKHIKH (Central Aero-Hydrodynamics Institute, Zhukovski, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 11 p. Aug. 1992 11 p
(IAF PAPER 92-0851) Copyright

The characteristics of a Russian multipurpose reusable system for two-stage orbit injections, named MAKS, are described and compared with those of Ariane V/Hermes, H2/Hope, Sanger-2, An-225/Interim HOTOL, NASP, and X-30. MAKS system comprises two stages: the basic aircraft An-225 for the first stage and a reusable orbital spacecraft with a disposable external fuel tank for the second. MAKS will have the capability of injecting into orbit payloads weighing between 7 and 9 tons. I.S.

A92-57252
ROCKET SPACE TRANSPORTATION SYSTEMS, PRODUCED BY 'YUZHNOYE' ROCKET-SPACE ASSOCIATION
Y. A. SMETANIN (Yuzhnoye Design Office, Dnepropetrovsk, Ukraine) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 8 p. Aug. 1992 8 p
(IAF PAPER 92-0862) Copyright

The paper examines the main performance and the possibility of commercial use of a space transportation system constructed by the Yuzhnoye Association. Its payload capability ranges from 500 to 15,000 kgf for low orbits and from 500 to 3000 kgf for geostationary orbits. The system's three basic components are analyzed. Tsyklon and SS-18K launch vehicles are designed on the basis of two-stage combat rockets using high-temperature propellants. They feature high reliability, moderate cost, and high automation of launch operations. The Zenith launch vehicle was developed in two versions: one for orbiting spacecraft at altitudes of up to 2000 km, and the other for launching spacecraft into high elliptic and stationary orbits. The Space Clipper is a commercial aircraft-rocket system intended for launching spacecraft weighing up to 2000 kgf into low orbits and 500 kgf into geostationary transfer orbits. P.D.

A92-57256
THE COMPARATIVE ANALYSIS OF VARIOUS AEROSPACE SYSTEM CONCEPTS
L. M. SHKADOV, V. E. DENISOV, V. V. LAZAREV, V. P. PLOKHIKH, V. I. BUZULUK, S. V. VOLODIN, K. A. CHERVONENKO, and V. V. SKIPENKO (Central Aero-Hydrodynamics Institute, Zhukovski, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 7 p. Aug. 1992 7 p refs
(IAF PAPER 92-0865) Copyright

The paper examines fully reusable winged two- and single-stage systems powered by hydrogen/oxygen rocket engines, which differ in types of takeoff (horizontal takeoff using an undercarriage; ground self-assisted takeoff; air launch from a subsonic carrier; and launching-pad vertical takeoff). The systems are optimized and compared using two criteria: payload mass and dry mass to payload mass ratio. The influence of the gross weight of a system and the technological level on the criteria involved is investigated. Of the concepts studied, launching-pad vertical takeoff and air launch are found to be the best from the standpoint of payload mass capability and specific launch cost. P.D.

N92-23753# Moscow Inst. of Aviation Technology (USSR).
THE USSR LAUNCHERS PROGRAMME
VASILY B. MISHIN *In* ESA, Launcher Propulsion Towards the Year 2010 p 33-38 Dec. 1991
Copyright Avail: CASI HC A02/MF A02; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 50 Dutch guilders

A review of the USSR launchers is presented. The first generation of Soviet launch vehicles were based on the intercontinental ballistic missile R7, first successfully launched on 22 Aug. 1957. Development of the R5 and R6 is outlined. The

following launch vehicles are discussed: Vostok, Soyuz and Molniya, Proton, NI, Energiya, and Zenit. Further directions in the development of launch vehicles are described. ESA

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SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques.

A92-55664
AN ADVANCED CONCEPT OF INTERNATIONAL SPACE TRANSPORTATION SYSTEM
A. I. DUNAEV (Glavkosmos, Moscow, Russia), S. F. KOSTROMIN, and V. M. SURIKOV (Central Research Institute of Machine Building, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 11 p. Aug. 1992 11 p
(IAF PAPER 92-0216) Copyright

An international space-transportation concept is considered in the light of increased global space activities and associated space-travel requirements. The system is based on the use of a two-stage launch vehicle with rocket engines and vertical takeoff as well as a reusable fly-back first stage booster. The design is suggested as an efficient means for placing GEO satellites in orbit, maintaining space stations, and providing rocket-space transport. C.C.S.

N92-14975# Tsentralni Aerogidrodinamicheskii Inst., Moscow (USSR).
AEROTHERMODYNAMIC CONFIGURATION OF FIRST GENERATION AEROSPACE PLANES (OF BURAN-TYPE) AND FIRST FLIGHT RESULTS
V. YA. NEILAND *In* ESA, Aerothermodynamics for Space Vehicles p 13-22 Jul. 1991
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 90 Dutch guilders

Some main factors influencing the Aerothermodynamics Configurations (ATC) of first generation aerospace planes, the problems to be solved during its selection, the phases of the ATC development, estimation methods for aerodynamic characteristics and heat fluxes, including laboratory experiments, numerical investigations and flight tests, are discussed. The circle of problems being considered is confined to the first generation aerospace planes of the type 'Buran'. Some data of fundamental importance concerning the convergence of aerothermodynamic characteristics preflight predictions with real flight test results are presented. ESA

N92-24760# Academy of Sciences (USSR), Moscow. Inst. of Applied Mathematics.
DYNAMICS OF AEROSPACE SHUTTLES
Y. G. SIKHARULIDZE, A. V. BUROV, and V. S. LADYGIN *In* ESA, Spacecraft Flight Dynamics p 307-310 Dec. 1991
Copyright Avail: CASI HC A01/MF A06; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 90 Dutch guilders

The controlled motion of an aerospace shuttle descending through the atmosphere is analyzed by using a mathematical modeling. The shuttle model includes a bank of aerodynamic characteristics, geometry, parameters of the reaction control system and aerodynamic control surfaces, algorithms of the control system, etc. The model of perturbed atmosphere describes the environment. In numerical integration of the motion equations certain difficulties arise because of discontinuities in the right hand side due to the switch on of orientation engines as well as small step of integration (0.03 to 0.05 s) and long time of descent through the atmosphere (1800 to 2000 s). Methods of increasing the accuracy of calculations by improving the models and computational techniques used are discussed. ESA

N92-27934# Joint Publications Research Service, Arlington, VA.
PROJECT MAKS AIR-LAUNCHED SPACEPLANE
V. A. SKORODELOV *In its* JPRS Report: Science and Technology. Central Eurasia: Space p 33-38 27 Jan. 1992 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow, USSR), no. 3, May - Jun. 1991 p 19-26
Avail: CASI HC A02/MF A01

The U.S. Space Shuttle and the U.S.S.R. Buran are large spacecraft that are designed to carry large payloads. Obviously, these powerful, expensive systems are no good for tasks that require taking small to medium sized cargoes to and from orbit. Such tasks need a reusable, orbital airplane that has a smaller cargo capacity and costs less to operate. A design involving a multipurpose aerospace system, called by its developers MAKS, satisfies those requirements entirely. The Spiral-Buran-MAKS represents a coherent, continuous chain of designs involving reusable space transportation systems. It is a two-stage complex in which the modified AN-225 Mriya carrier aircraft is employed as the first reusable stage. The second stage consists of the reusable orbital airplane and an expendable external fuel tank filled with fuel for the sustainer engines of the orbiter. Author

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SPACE COMM., SPACECRAFT COMM., COMMAND & TRACKING

Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout.

A92-12126
DETERMINATION OF THE POSITION AND ORIENTATION OF MOVING OBJECTS FROM THE READINGS OF STRAPDOWN INERTIAL NAVIGATION SYSTEM TRANSDUCERS BY SOLVING THE QUATERNION EQUATIONS OF MOTION OF THE GYROSCOPIC SYSTEMS ON THE ONBOARD COMPUTER [OPREDELENIE MESTOPOLOZHENIIA I ORIENTATSII PODVIZHNYKH OB'EKTOV PO POKAZANIIAM CHUVSTVITEL'NYKH ELEMENTOV BINS POSREDSTVOM RESHENIIA NA BORTOVOM VYCHISLITELE KVATERNIONNYKH URAVNENII DVIZHENIIA GIROSKOPICHESKIKH SISTEM]
IU. N. CHELNOKOV Akademiia Nauk SSSR, Izvestiia, Mekhanika Tverdogo Tela (ISSN 0572-3299), July-Aug. 1991, p. 3-12. In Russian. Aug. 1991 10 p In RUSSIAN refs
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An approach to the determination of the geographic coordinates and orientation parameters of moving objects in inertial and rotating reference coordinates from the current readings of the transducers of strapdown inertial navigation systems is considered which is based on a dynamic analogy of nonperturbable gyroscopic systems and two-component inertial navigation systems. The use of precession quaternion equations of motion is discussed. The use of quaternions (Rodrigues-Hamilton parameters) makes it possible to obtain algorithms that are convenient from the computational standpoint. V.L.

A92-13719
THE INFLUENCE OF RELATIVISTIC EFFECTS ON RESULTS OF SATELLITE GEODYNAMICS, GEODESY, AND NAVIGATION - RESULTS OF INVESTIGATIONS [VLIIANIE RELIATIVISTSKIKH EFFEKTOV NA REZUL'TATY SPUTNIKOVOI GEODINAMIKI, GEODEZII I NAVIGATSII - REZUL'TATY ISSLEDOVANII]
N. V. EMEL'IANOV (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) and A. V. KRIVOV (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR) Astronomicheskii Zhurnal (ISSN 0004-6299), vol. 68, Sept.-Oct. 1991, p. 1093-1098. In Russian. Oct. 1991 6 p In RUSSIAN refs
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The influence of the omission of relativistic effects on the practical solution of various satellite-motion problems is investigated using a realistic simulation method. The modeling method, formulas, and description of the set of programs for taking account of the relativistic effects are presented. It is shown that the conclusion regarding the influence of the omission of relativistic effects on the final result depends essentially on problem formulation. P.D.

A92-18273
ANALYTICAL METHODOLOGY FOR EVALUATING THE EFFECT OF THE IONOSPHERE ON THE NOISE IMMUNITY OF SPACE COMMUNICATION SYSTEMS [ANALITICHESKAIA METODIKA OTSENKI VLIIANIA IONOSFERY NA POMEKHOUSTOICHIVOST' SISTEM KOSMICHESKOI SVIAZI]
V. P. PASHINTSEV, A. D. SAPOZHNIKOV, and L. L. VITITLOV Radiotekhnika (ISSN 0033-8486), Nov. 1991, p. 80-83. In Russian. Nov. 1991 4 p In RUSSIAN refs
Copyright
An analytical methodology is developed for assessing the effect of the scattering and dispersion properties of the ionosphere on the noise immunity of the noncoherent reception of broadband signals in space communications systems. The probability of error is obtained as a function of the frequency parameters of the transmitted broadband signals (carrier frequency and bandwidth) and the physical parameters of the ionosphere (the average electron density and the intensity of irregularities) determining its scattering and dispersion properties. L.M.

A92-23638
ALGORITHM FOR THE RECOGNITION OF STARS ON A PAIR OF OVERLAPPING IMAGES OF THE STARRY SKY [ALGORITM OPOZNAVANIIA ZVEZD NA PARE PEREKRYVAIUSHCHIKHSIA IZOBRAZHENII ZVEZDNOGO NEBA]
I. G. ZHURKIN (Moskovskii Institut Inzhenerov Geodezii, Aerofotos'emki i Kartografii, Moscow, USSR) and P. B. TOLKACHEV (Tsentral'nyi NII Geodezii, Aeros'emki i Kartografii, Moscow, USSR) Geodeziia i Aerofotos'emka (ISSN 0536-101X), no. 2, 1991, p. 59-65. In Russian. 1991 7 p In RUSSIAN
Copyright
An algorithm for the automatic recognition of identical stars on a pair of overlapping images of the starry sky is described, and substantiated theoretically. Results of the computer simulation of the automatic recognition process described here are presented. The results are pertinent to the solution of various space-navigation problems. L.M.

A92-23642
DIFFERENTIAL REFINEMENT OF THE INITIAL CONDITIONS OF THE MOTION OF AN ARTIFICIAL EARTH SATELLITE FROM THE RESULTS OF THE PHOTOGRAMMETRIC PROCESSING OF SPACE PHOTOGRAPHS [DIFFERENTSIAL'NOE UTOCHNENIE NACHAL'NYKH USLOVII DVIZHENIIA ISZ PO REZUL'TATAM FOTOGRAMMETRICHESKOI OBRABOTKI KOSMICHESKIKH SNIMKOV]
T. K. DEDOVA (Moskovskii Institut Inzhenerov Geodezii, Aerofotos'emki i Kartografii, Moscow, USSR) Geodeziia i Aerofotos'emka (ISSN 0536-101X), no. 2, 1991, p. 95-102. In Russian. 1991 8 p In RUSSIAN refs
Copyright
Methodology for the differential refinement of the initial conditions of satellite motion on the basis of the photographic processing of space photos is described. The measurements used are coordinate points of the earth surface on topographic photos oriented in inertial space and orientation angles of the space photography bases. L.M.

A92-25961
INVESTIGATION OF SCH-2 SATELLITE NAVIGATION INSTRUMENTATION [ISSLEDOVANIE SPUTNIKOVOI NAVIGATSIONNOI APPARATURY SCH-2]
IU. G. FIRSOV Geodeziia i Kartografiia (ISSN 0016-7126), Sept. 1991, p. 15-20. In Russian. Sep. 1991 6 p In RUSSIAN refs
Copyright
A description is given of the Soviet SCh-2 system, which is intended for the determination of ship coordinates on the basis of radio signals from the Transit and Tsikada satellite navigation system. Ship experiments have indicated that the SCh-2 is currently the best Soviet system for civilian users of first-generation satellite navigation systems. L.M.

A92-30364
A MODIFIED KALMAN FILTER IN A PROBLEM OF SPACE NAVIGATION [MODIFITSIROVANNYI FIL'TR KALMANA V ZADACHE KOSMICHESKOI NAVIGATSII]
A. V. EMEL'IANOV Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriia Priborostroenie (ISSN 0236-3933), Jan.-Mar. 1991, p. 49-52. In Russian. Mar. 1991 4 p In RUSSIAN refs
Copyright
The paper examines an adaptive algorithm for estimating the state vector of a system, making it possible to obtain a stable estimate of the navigation parameters of an object in the case of the indeterminacy of its model. This algorithm permits an accurate estimation of the coordinates of a spacecraft at some remove from the earth in the process of observing its state vector. This estimation algorithm can be implemented in an onboard processor. B.J.

A92-33776
STUDIES OF THE ACCURACY OF NAVIGATIONAL MEASUREMENTS [ISSLEDOVANIIA TOCHNOSTI NAVIGATSIONNYKH OPREDELENII]
A. A. KLIUIKOV Geodeziia i Kartografiia (ISSN 0016-7126), Jan. 1992, p. 21, 22. In Russian. Jan. 1992 2 p In RUSSIAN refs
Copyright
The accuracy of the differential GPS method for obtaining navigational determinants, based on pseudodistance corrections (Blackwell, 1989), was estimated using a computer model. For this purpose, an orbital spacecraft classification model was developed in accordance with the standard GLONASS satellite structure (24 spacecraft in three orbital planes, with an orbital tilt of 65 deg, an altitude of 20,000 km, and an orbital eccentricity of 0.001) and two variants of spacecraft observations were considered, one with all observable spacecraft and the other with only four spacecraft forming the optimal configuration. It is shown that observations using all observable spacecraft were 15-20 percent more accurate than data obtained with only four spacecraft. It was also found that, using the differential regime, the ephemeris and the time-and-frequency errors due to the increase of the distance from the user are practically nonexistent. Even at a distance of 2000 km, the accuracy using the differential regime was about twice as high as that obtained with the standard regime. I.S.

A92-36538
NONLINEAR CONTROLLER DESIGN FOR STRAPDOWN INERTIAL NAVIGATION SYSTEMS [KONSTRUIROVANIE NELINEINOGO REGULIATORA DLIA BESPLATFORMENNYKH INERTSIAL'NYKH NAVIGATSIONNYKH SISTEM]
L. M. IAKOVLEVA (Kievskii Politekhnicheskii Institut, Kiev, Ukraine) Kibernetika i Vychislitel'naia Tekhnika (ISSN 0454-9910), no. 91, 1991, p. 25-31. In Russian. 1991 7 p In RUSSIAN refs
Copyright
A method for the construction of a set of permissible controllers is applied to error equations for strapdown inertial navigation systems described by ordinary differential equations with stochastic perturbations of initial conditions and right-hand terms. The problem is solved analytically using the second Liapunov method. For a particular case, a method for optimizing free controller parameters is proposed. V.L.

S. N. EGOROV Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 30, no. 1, Jan.-Feb. 1992, p. 38-44. In Russian. Feb. 1992 7 p In RUSSIAN refs
Copyright

The paper examines the synthesis of algorithms for the processing of measurement data in spacecraft attitude determination systems using methods of observation system theory. It is noted that, in the case of such synthesis, it is useful to consider not only the kinematic but also the dynamic equations of the spacecraft's rotation. The use of such additional a priori information can make it possible to reduce the number of measuring instruments or to enhance the attitude accuracy with the same number of measuring instruments. L.M.

A92-40656
SYNTHESIS OF THE OPTIMAL NONLINEAR CONTROL OF SPACECRAFT ROTATION [SINTEZ OPTIMAL'NOGO NELINEINOGO UPRAVLENIIA VRASHCHENIEM KOSMICHESKOGO APPARATA]

V. V. MARTYNENKO and S. V. PUSHKOVA Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 30, no. 1, Jan.-Feb. 1992, p. 52-59. In Russian. Feb. 1992 8 p In RUSSIAN refs
Copyright

Nonlinear feedback control laws are developed which are intended for the rotation control (reorientation maneuevers) of a spacecraft whose motion is described by nonlinear Euler equations. A system of four bodies consisting of a dynamically nonsymmetrical spacecraft and three flywheels is considered as an example. In the case considered the control is realized via the control moments of the flywheels. L.M.

A92-40665
DETERMINATION OF THE PASSIVE ROTATIONAL MOTION OF THE MIR-KVANT ORBITAL COMPLEX FROM GEOMAGNETIC FIELD INTENSITY MEASUREMENTS [OPREDELENIE PASSIVNOGO VRASHCHATEL'NOGO DVIZHENIIA ORBITAL'NOGO KOMPLEKSA 'MIR'-'KVANT' PO IZMERENIIAM NAPRIAZHENNOSTI GEOMAGNITNOGO POLIA]

V. A. SARYCHEV, V. V. SAZONOV, M. IU. BELIAEV, N. I. EFIMOV, I. L. LAPSHINA, and V. M. STAZHKOV Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 30, no. 1, Jan.-Feb. 1992, p. 136-140. In Russian. Feb. 1992 5 p In RUSSIAN refs
Copyright

The integral statistical method for determining the passive rotational motion of the orbital stations Salyut-6 and -7 from solar and magnetic sensor data, which is based on universal mathematical models, has been adapted, with slight changes, for solving similar problems in the case of the Mir station. Here, results obtained with this approach and changes necessitated by the special features of the Mir orientation control system are discussed. In particular, under normal operation, the passive motion of the station can be determined from magnetometer data alone, with a certain reduction in accuracy. V.L.

A92-42774
MATHEMATICAL MODELING OF THE DEPLOYMENT OF A MULTILEAF SOLAR ARRAY [MATEMATICHESKOE MODELIROVANIE DINAMIKI RASKRYTIIA MNOGOSTVORCHATOI SOLNECHNOI BATAREI]

V. I. PANICHKIN Rossiiskaia Akademiia Nauk, Izvestiia, Mekhanika Tverdogo Tela (ISSN 0572-3299), no. 1, Jan.-Feb. 1992, p. 177-180. In Russian. Feb. 1992 4 p In RUSSIAN refs
Copyright

A study is made of the plane motion of a system of hinged rigid rods modeling the frames of solar arrays which unfold into a straight structure by means of a spring and linkage mechanism. Changes in the configuration of the system of rods in the deployment plane are described by equations of plane-parallel motion for an absolutely rigid body, which are solved numerically using Newmark's (1959) method. The results make it possible to select the optimum deployment parameters. V.L.

A92-42776
ANALYSIS AND SYNTHESIS OF HIGH-PRECISION CONTROL FOR FLIGHT VEHICLES [ANALIZ I SINTEZ VYSOKOTOCHNOGO UPRAVLENIIA LETATEL'NYMI APPARATAMI]

VENIAMIN V. MALYSHEV and ANDREI I. KIBZUN Moscow, Izdatel'stvo Mashinostroenie, 1987, 304 p. In Russian. 1987 304 p In RUSSIAN refs
Copyright

A new approach is proposed for solving problems in the analysis and synthesis of high-precision control algorithms for flight vehicles whose motion is affected by various random and indeterminate factors. A relationship is established between the traditional stochastic approach and the minimax approach. Methods are presented for the synthesis of optimal control algorithms that guarantee (in terms of probability) the solution of a given problem. A series of problems related to the control of flight vehicles of different types are solved as an example. V.L.

A92-49175
SPEED-OF-RESPONSE OPTIMIZED BRAKING AND TRIAXIAL ORIENTATION OF A RIGID BODY [OPTIMAL'NOE PO BYSTRODEISTVIIU TORMOZHENIE I TREKHOSNAIA ORIENTATSIIA TVERDOGO TELA]

V. I. GULIAEV, V. L. KOSHKIN, and I. V. SAVILOVA (Kievskii Inzhenerno-Stroitel'nyi Institut, Kiev, Ukraine) Vychislitel'naia i Prikladnaia Matematika (ISSN 0321-4117), no. 66, 1988, p. 89-95. In Russian. 1988 7 p In RUSSIAN refs
Copyright

The problem of the speed-of-response optimized braking of the rotation of a rigid body and its triaxial orientation is considered for the case of arbitrary mass geometry of the body. A numerical-analytical method for solving the problem is proposed which is based on the combined use of the Rodrigues-Hamilton parameters and Euler angles. An analysis of solutions for specific problems is presented. V.L.

A92-52815
INTERACTION EFFECTS OF RAREFIED FLOWS OF HIGH SPEED SOLID PARTICLES ON THE SURFACE (BASED ON THE VEGA SPACECRAFT EXPERIMENTS)

M. P. BURGASOV, A. B. NADIRADZER, IU. A. RYZHOV, and S. B. SVIRCHEVSKII (Moscow Aviation Institute, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 9 p refs
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The paper gives a comparative analysis between the results based on measurements of dust particle parameters by means of the Photon instruments and the data on the degradation of solar batteries obtained in the course of experiments flown by the Vega spacecraft. A degradation model allowing for the peculiarities of the high-speed interaction between dust particles and the surface is proposed. It is shown that the dominant mechanism of degradation consists of shunting of a photoconverter resulting from melting of a semiconductor when large particles strike it. The distribution function of large particles obtained by means of the Photon instruments yields a good correspondence between the calculated and the factual levels of solar batteries' power losses. Author

A92-52817
KINETIC MODELLING OF FLOWS NEAR COMPLEX FORM BODIES

L. V. MISHINA, A. N. KRYLOV, A. A. PIARNPUU, and L. L. ZVORYKIN (Russian Academy of Sciences, Computing Center, Moscow, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 7 p refs
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A method is proposed for calculating the density, the fluxes of particles, the momentum, and the energy of the flowfield near the outgassing surface of a complex-form vehicle in the stationary flow of a strongly rarefied multicomponent gas. The applicability

of the method is illustrated with several examples, including a determination of the effect of molecular dissociation on the distribution of the concentrations of atomic and molecular oxygen near the streamlined sphere; a calculation of reverse fluxes to the sphere, taking into account the dissociation of O2 molecules; and a calculation of concentration fields of gaseous particles near the spacecraft, taking into account the incoming flow. I.S.

A92-53608
REALIZATION OF PLANE ROTATION PRINCIPLES ABOUT THE THREE-DIMENSIONAL AXIS IN REMOTE DIRECTORIAL CONTROL CONDITIONS
EDWARD MITROSHIN, VALERII GORBATENKO, ALEKSEI KRYMOV, EVGENII SAMSONOV, GENNADII KHARITONOV, and MARINA KOSTENKO (Rossiiskaia Akademiia Nauk, Sovet Interkosmos, Moscow, Russia) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 1 1990 6 p
Copyright

Analytical approaches are set forth for studying the design of remote directorial control systems in the case of plane rotation about a space axis. Two techniques are examined for shaping optimal reference trajectories based on: (1) the solution of a system of nonlinear Eulerian kinematic and dynamic equations; and (2) shaping reference trajectories when the control-moment vectors are noncolinear with respect to unit vectors of systems of the body axes. The reference trajectories are obtained in coordinate forms so that closed control can be defined, and the number of calculations required for deriving the optimum trajectory is reduced. The optimum trajectory is the fastest response for attitude reorientation, and an operator can theoretically accomplish the maneuver efficiently with the proposed combined techniques. C.C.S.

A92-53883
EVOLUTION OF THE RAPID ROTATIONS OF A BODY WITH A VISCOELASTIC MEMBRANE IN CIRCULAR ORBIT [OB EVOLIUTSII BYSTRYKH VRASHCHENII TELA S UPRUGOVIAZKOI MEMBRANOI NA KRUGOVOI ORBITE]
O. V. KHOLOSTOVA Rossiiskaia Akademiia Nauk, Izvestiia, Mekhanika Tverdogo Tela (ISSN 0572-3299), no. 2, Mar.-Apr. 1992, p. 3-8. In Russian. Apr. 1992 6 p In RUSSIAN refs
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The system considered here consists of a rigid lifting body and a viscoelastic circular membrane attached to the body in such a way that one of its axes of symmetry coincides with one of the main central axes of symmetry of the nondeformed system. The system is moving in a central Newtonian gravitational field in circular orbit. It is assumed that the membrane is sufficiently stiff and that dissipative forces are small in comparison with other forces. In the context of linear elasticity, a system of differential equations is obtained which describes the motion of the body in the quasi-static regime. The evolution of the rapid rotations of the system relative to the center of mass is investigated using the averaging method. V.L.

A92-55528
GRAVITY ORIENTATION OF LARGE SPACE STATIONS
V. A. SARYCHEV and V. V. SAZONOV (Russian Academy of Sciences, Institute of Applied Mathematics, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 8 p. Aug. 1992 8 p refs
(IAF PAPER 92-0032) Copyright

Attitude motion of the earth's artificial satellite is studied for the single-axis gravity-gradient stabilization. The assumptions about the satellite inertia tensor, which are valid for large orbital stations like Salyut 6 and 7, allow the introduction of small parameters into the rotational motion equations and to construct three types of 2D integral manifolds of these equations, describing nominal motions of the satellite for the above stabilization mode. Emphasis is given to the case when such manifolds consist of periodic solutions. Author

A92-55676
ELABORATION CONFIGURATION OF MARTIAN MANNED EXCURSION MODULE
R. IU. ZHITS (Moscow Aviation Institute, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 8 p. Aug. 1992 8 p refs
(IAF PAPER 92-0231) Copyright

Potential material was carried out taking into account Mars exploration program, proposed by Russia, and possible variants of the American Mars Exploration Program, proposed in the Stafford's Synthesis Group final report. The paper analyzes the basic designs, states the Mars Excursion Module (MEM) concept and describes how the design lay-out is defined. Moreover the paper considers influence of main requirements and limitations on defining optimal MEM configuration. Author

N92-11620# Joint Publications Research Service, Arlington, VA.
TECHNICAL REQUIREMENTS OF SICK BAYS ABOARD SPACE SHIPS Abstract Only
A. V. PERKOVSKIY *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 5 7 Oct. 1991 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 24, no. 6, Nov. - Dec. 1990 p 62-64
Avail: CASI HC A01/MF A01

The technical components of sick bays aboard space ships must be designed to create an optimal medical environment. Within the close confines of a space ship, air contamination by bacteria is a high priority concern, and systems must be designed to minimize this hygienic factor. Accordingly, cursory description is provided of individual subcomponents of such a system that regulates air temperature, gas composition, relative humidity, air currents, and bacterial counts. In addition, a table is provided of a permissible range of values for every parameter of interest in the different compartments of the space ship. Author

N92-13082# Joint Publications Research Service, Arlington, VA.
COMMENTARY ON GRANAT PROJECT
R. SYUNYAYEV *In its* JPRS Report: Science and Technology. USSR: Space p 16-17 30 Jul. 1990 Transl. into ENGLISH from Pravda, Moscow (USSR), 3 Dec. 1989 p 6
Avail: CASI HC A01/MF A01

General information is given on the Granat Project. Granat is the first specialized x-ray and gamma-ray satellite produced by the U.S.S.R. The observatory's scientific instruments include the ART-P and ART-S astronomical x-ray telescopes. Granat also carries a large set of gamma ray-burst equipment. Operation of the spacecraft and some of its observations are briefly surveyed. Author

N92-14101# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: SPACE
22 Nov. 1991 100 p Transl. into ENGLISH from various Russian articles
(JPRS-USP-91-007) Avail: CASI HC A05/MF A02

This is a compilation of translated articles from Soviet publications. The general areas of discussion are as follows: manned mission highlights; space sciences; interplanetary sciences; space engineering; space applications; and space policy. Two articles of special interest are Small Solar Sail Spacecraft for Regatta Project, and History of EPOS Air Launched Spaceplane Project.

N92-14102# Joint Publications Research Service, Arlington, VA.
SMALL SOLAR SAIL SPACECRAFT FOR REGATTA PROJECT
G. A. AVANESOV and V. I. KOSTENKO *In its* JPRS Report: Science and Technology. USSR: Space p 8-13 22 Nov. 1991 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow, USSR), no. 1, Jan. - Feb. 1991 p 3-8
Avail: CASI HC A02/MF A02

Details are being worked out of the Regatta project, which calls for the development of a Small Space Laboratory, for which light pressure will be used to effect attitude control and stabilization. The project's goal is the study of solar-planetary relationships (solar

on board the Cosmos-1809 satellite (launched on July 18, 1986), which uses a secondary electron multiplier and a toroidal electrostatic analyzer to study low-energy electrons and ions, are described, and examples of measurements are presented. It is noted that the principal disadvantage of such analyzers is a strong defocusing of the detected particles, especially electrons. Although the interpretation of the results requires additional analysis, instruments of this type are still viable where small size and weight are important considerations. V.L.

A92-53933
CHOICE OF INSTRUMENTATION FOR SPACEBORNE MONITORING OF THE OZONOSPHERE [O VYBORE APPARATURY DLIA KOSMICHESKOGO MONITORINGA OZONOSFERY]
N. V. TEREB IN: Atmospheric optics 1991 8 p In RUSSIAN refs
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The paper examines the advantages and drawbacks of UV instrumentation designed for monitoring the ozonosphere from space platforms in which interference filters are used to isolate the required spectral regions. It is shown that the interference filters do not allow the mapping of the ozone concentration field. They also do not provide the required measurement accuracy owing to their low contrast and instability. L.M.

A92-56395
SPACE GROUND INTERFEROMETER
A. I. SAVIN, M. B. ZAKSON (Kometa Corp., Moscow, Russia), and L. I. MATVEENKO (Russian Academy of Sciences, Space Research Institute, Moscow, Russia) IN: Radio interferometry: Theory, techniques, and applications; Proceedings of the 131st IAU Colloquium, Socorro, NM, Oct. 8-12, 1990 1991 3 p refs
Copyright

A space project for studying ecological earth problems is being carried out by means of radio techniques. A 30 m prototype antenna has already been deployed and tested. The radio telescope will be launched in 1994 into a circular orbit having an altitude 600 km and an inclination of 65 deg. The planned mission time is 1.5 year or more; 25 percent of this will be available for VLBI observations at wavelengths 6 and 18 cm. Author

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SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

A92-12205
NUMERICAL MODELING OF UNSTABLE COMBUSTION IN SOLID-PROPELLANT ROCKET ENGINES [CHISLENNOE MODELIROVANIE NEUSTOICHIVOGO GORENIIA V RAKETNYKH DVIGATELIAKH NA TVERDOM TOPLIVE]
S. A. EKIMTSOV and N. A. KULACHKOVA (AN SSSR, Kazanskii Fiziko-Tekhnicheskii Institut, Kazan, USSR) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0869-1339), July-Aug. 1991, p. 40-44. In Russian. Aug. 1991 5 p In RUSSIAN refs
Copyright

Unstable combustion in solid-propellant rocket engines is investigated by using a phenomenological combustion model based on the hypothesis about the existence of a delay in the response of the combustion process to changing conditions. The differential equations describing flow in the combustion chamber are approximated by using the first-order arbitrary Lagrangian-Eulerian method with artificial viscosity. The artificial viscosity makes it possible to result steep pressure fronts without oscillations before and after the discontinuity. V.L.

A92-12594
LIQUID ROCKET ENGINES FOR LARGE THRUST - PRESENT AND FUTURE
A. SERGIENKO (Moskovskii Aviatsionnyi Institut, Moscow, USSR) IAF, International Astronautical Congress, 42nd, Montreal, Canada, Oct. 5-11, 1991. 13 p. Oct. 1991 13 p refs
(IAF PAPER 91-260) Copyright

Improvements in the design and performance of liquid-propellant rocket engines are discussed generally and with reference to the specific programs. The present limits of achievable efficiency are related to thermal efficiency which is related to elements such as cooled blades, propellants, and nozzle design. A significant increase in the total gas pressure can be achieved by employing a turbopump fuel-feed system in a closed-cycle rocket engine with cooled blades. The problems of heat flux, combustion efficiency, and combustion-chamber dimensions are related to the high-pressure combustion chamber. The issues of regeneration and turbulence are reviewed, and proposals are given for improving engine efficiency by using environmental matter as oxidizers and other elements. The efficiency rating of the liquid rocket engines can be improved - particularly in the case of the rotor-type engine - by incorporating the proposed design modifications. C.C.S.

A92-12598
ANALYSIS OF EFFICIENCY OF SYSTEMS WITH OXIDIZER LIQUEFACTION AND ACCUMULATION FOR IMPROVEMENT OF AEROSPACEPLANE PERFORMANCE
A. S. RUDAKOV, R. IU. GATIN, N. P. DULEPOV, B. N. KORAL'NIK, G. D. KHARCHEVNIKOVA, and O. K. IUGOV (Tsentral'nyi Nauchno-Issledovatel'skii Institut Aviatsionnogo Motorostroeniia, Moscow, USSR) IAF, International Astronautical Congress, 42nd, Montreal, Canada, Oct. 5-11, 1991. 8 p. Oct. 1991 8 p refs
(IAF PAPER 91-270) Copyright

Results are presented from theoretical treatments of the influence exerted by propulsion system parameters and the ascent and cruising operational modes on an aerospaceplane propulsion system employing LH2 fuel heatsink-based air liquefaction/accumulation. These results are compared with similar projections for the case of an aerospaceplane without liquid air accumulation. The accumulation feature is shown to be capable of yielding a payload-enhancement factor of 1.7-2.0 for equal aerospaceplane initial mass of 300 tonnes. Accumulation is most advantageous during the cruise flight regime. O.C.

A92-29713
SPACE THERMONUCLEAR POWER PLANTS
L. A. LATYSHEV and N. N. SEMASHKO IN: CUSAE '91; Proceedings of the 1st China-USSR Seminar on Aero Engines, Nanjing, People's Republic of China, Apr. 15-20, 1991 1991 17 p refs

A speculative evaluation is made of the prospective economic performance and environmental benefits of orbiting thermonuclear powerplants that beam their energy output back to earth via microwave transmission. Attention is given to the most plausible paths to fusion reactions for this long-term project, whose development and deployment is envisioned as an international effort. It is assumed that the orbiting reactor could serve as a source of orbit-transfer power for other spacecraft. O.C.

A92-40454
PROSPECTS OF APPLICATION OF SOLAR ARRAYS WITH CONCENTRATORS ON NEAR-EARTH ORBITS
A. S. KOROTEEV, A. M. KOSTYLEV, and V. S. TVERSKOI (Scientific Research Institute of Thermal Processes, Moscow, Russia) IN: SPS 91 - Power from space; Proceedings of the 2nd International Symposium, Gif-sur-Yvette, France, Aug. 27-30, 1991 1991 5 p

The development of solar arrays with solar radiation concentrators is reviewed with attention given to the practical implications of using concentrators. The optimal orientation of the concentrators is described, and the application of the devices can reduce the need for the GaAs semiconductor materials needed

for the photovoltaic converters. The use of solar concentrators can increase the service life of the converters and is therefore of interest to satellite and other spacecraft applications. C.C.S.

A92-40483
ABOUT THE POSSIBILITY OF POWER SUPPLY OF SPACECRAFT BY GROUND LASER BEAMS
IU. I. KRUZHILIN (NPO Astrofizika, Moscow, Russia) IN: SPS 91 - Power from space; Proceedings of the 2nd International Symposium, Gif-sur-Yvette, France, Aug. 27-30, 1991 1991 7 p

Using experimental results and estimations the possibility is shown of providing an average power of 100 kW on board a spacecraft by means of a ground-based laser station with average laser power (400-500 kW). Atmosphere transmission, cooling on board, safety, demands of a laser station and spacecraft network have been taken into consideration. A conception is considered of a global nonelectric solar-laser space system to provide the total power of 10 TW onto earth. Projects are suggested of full-scale experiments for the integrity of key technologies. Author

A92-40486
TOPAZ OPTIMAL SOURCE OF ELECTRICAL ENERGY FOR ADVANCED CIVIL SPACE APPLICATIONS
G. M. GRIAZNOV (NPO Krasnaia Zvezda, Moscow, Russia) IN: SPS 91 - Power from space; Proceedings of the 2nd International Symposium, Gif-sur-Yvette, France, Aug. 27-30, 1991 1991 4 p

This paper discusses the possible advanced civil space missions for nuclear power systems of the 'Topaz' family. Two successful flight tests onboard spacecraft 'Cosmos-1818' and 'Cosmos-1867' provided operationability of the system in actual space conditions and gave the USSR prestige in thermionic systems development. The design of the Topaz system provides nuclear and radiation safety in accordance with the United Nations Organization recommendations. Author

A92-40614
THE CURRENT STATUS OF ELECTROSTATIC ENGINES AND VARIOUS ELECTROSTATIC DEVICES [OSOBENNOSTI SOVREMENNOGO ETAPA RAZVITIIA ELEKTROSTATICHESKIKH DVIGATELEI I RAZLICHNYKH ELEKTROSTATICHESKIKH USTANOVOK]
L. A. LATYSHEV, N. A. MASLENNIKOV, and N. N. SEMASHKO Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1991, p. 72-75. In Russian. 1991 4 p In RUSSIAN refs
Copyright

Current trends in the design and development of electrostatic engines and various electrostatic devices and systems, including those used in space research, nuclear fusion, thin-film production, and other fields, are briefly reviewed. Particular attention is given to the increasing reliance on the existing standard modules when developing new equipment, which greatly reduces the development, fabrication, and maintenance costs and improves reliability. Consideration is also given to the selection of the optimal type and size of electrostatic equipment and the selection of the proper quality criterion in the development of electrostatic rocket engines. V.L.

A92-42781
THEORY OF INTRACHAMBER PROCESSES AND DESIGN OF SOLID-PROPELLANT ROCKET ENGINES [TEORIIA VNUTRIKAMERNYKH PROTSESSOV I PROEKTIROVANIE RDTT]
BORIS T. EROKHIN Moscow, Izdatel'stvo Mashinostroenie, 1991, 560 p. In Russian. 1991 560 p In RUSSIAN refs
(ISBN 5-217-00795-8) Copyright

The theory of processes taking place inside the combustion chamber of solid-propellant rocket engines is presented, and methods of optimizing the design of such engines are discussed. In particular, attention is given to the selection of the solid propellant charge and igniters, volume density of the charge, structural and heat insulation materials, and thrust vector control devices. Examples of calculations of the nonstationary and quasi-stationary operating regimes and energy and mass characteristics are presented. V.L.

A92-45225
THE DEVELOPMENT OF SOVIET ROCKET ENGINES (FOR STRATEGIC MISSILES)
ALEXANDER BOLONKIN Falls Church, VA, Delphic Associates, Inc., 1991, 152 p. Translation. 1991 152 p refs
(ISBN 1-55831-130-0) Copyright

A first-hand account of developments in the Soviet rocket industry is presented. The organization and leadership of the rocket and missile industry are traced from its beginning in the 1920s. The development of the Glushko Experimental Design Bureau, where the majority of Soviet rocket engines were created, is related. The evolution of Soviet rocket engines is traced in regard to both their technical improvement and their application in missiles and space vehicles. Improved Glushko engines and specialized Isaev and Kosberg engines are discussed. The difficulties faced by the Soviet missile and space program, such as the pre-Sputnik failures, the oscillation problem of 1965/1966, which exposed a weakness in Soviet ICBM missiles, and the Nedelin disaster of 1960, which cost the lives of more than 200 scientists and engineers, as well as the Commander-in-Chief of the Strategic Rocket Forces, Marshall Nedelin, are examined. C.A.B.

A92-48781#
MEASUREMENT OF PLASMA PARAMETERS IN THE STATIONARY PLASMA THRUSTER (SPT-100) PLUME AND ITS EFFECT ON SPACECRAFT COMPONENTS
S. K. ABSALAMOV, V. B. ANDREEV (Research Institute of Applied Mechanics and Electrodynamics, Moscow, Russia), T. COLBERT, M. DAY (Space Systems/Loral, Palo Alto, CA), V. V. EGOROV (Research Institute of Applied Mechanics and Electrodynamics, Moscow, Russia), R. U. GNIZDOR (FAKEL, Kaliningrad, Russia), H. KAUFMAN (Front Range Research, Fort Collins, CO; Commonwealth Scientific Corp., Alexandria, VA), V. KIM (Research Institute of Applied Mechanics and Electrodynamics, Moscow, Russia), A. I. KORIAKIN, K. N. KOZUBSKII (FAKEL, Kaliningrad, Russia) et al. AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 28th, Nashville, TN, July 6-8, 1992. 10 p. Jul. 1992 10 p refs
(AIAA PAPER 92-3156) Copyright

The results of measurement of plasma parameters including the angular distribution of current density and ion energy in the SPT-100 plume are presented. Measurement of the plume's effect on glass and metal control samples, as well as samples of the solar array cover glass and other construction elements are reported. Results of these measurements permit the estimation of the SPT plume influence on Spacecraft components and the optimization of the thruster/spacecraft integration design. Author

A92-54213#
STATE AND PROSPECTS OF SOLID PROPELLANT ROCKET DEVELOPMENT
V. KH. KUKUSHKIN (NPO Iuzhnoe, Dnepropetrovsk, Ukraine) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 28th, Nashville, TN, July 6-8, 1992. 10 p. Jul. 1992 10 p
(AIAA PAPER 92-3872) Copyright

An overview is presented of aspects of solid-propellant rocket engine (SPRE) development with individual treatment given to sustainer and spacecraft SPRE technologies. The paper focuses on low-modulus fuels of composite solid propellant, requirements for adhesion stability, and enhancement of the power characteristics of solid propellants. R&D activities are described that relate to the use of SPREs with extending nozzles and to the design of ultradimensional nozzles for upper-stage engines. Other developments for the SPREs include engines with separate loading and pasty fuel applications, and progress is reported in the direction of detonation SPREs. The SPREs using pasty propellants provide good control over thrust characteristics and

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COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

A92-10863
STRENGTH OF UNIDIRECTIONAL EPOXY COMPOSITES AND THE FIBER-MATRIX INTERFACE UNDER CYCLIC COOLING TO LOW TEMPERATURES [PROCHNOST' ODNONAPRAVLENNYKH EPOKSIDNYKH KOMPOZITOV I GRANITSY RAZDELA VOLOKNO-MATRITSA PRI TSIKLICHESKOM OKHLAZHDENII DO NIZKIKH TEMPERATUR]
V. I. KVLIVIDZE, IU. A. GORBATKINA, V. G. IVANOVA-MUMZHIEVA, A. M. KUPERMAN, and N. K. SHAIDUROVA (AN SSSR, Institut Khimicheskoi Fiziki; Nauchno-Tekhnicheskii Kooperativ 'Problemy Mekhaniki i Tekhnologii', Moscow, USSR) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), May-June 1991, p. 387-394. In Russian. Jun. 1991 8 p In RUSSIAN refs
Copyright

Experiments were carried out on epoxy-matrix composites unidirectionally reinforced by glass, carbon, and organic fibers to investigate the effect of cyclic cooling from room temperature to liquid nitrogen and helium temperatures on the composite strength, fiber-matrix adhesion, and IR transmission spectra. It is found that thermal cycling (1000 cycles to 77 K and 10 cycles to 4 K) does not produce any irreversible changes in the materials studied. 1000-cycle cooling to 77 K reduces the fiber-matrix adhesion strength; 2000 cycles produce changes in the IR spectra of the glass/epoxy composite. V.L.

A92-10869
A STUDY OF THE MECHANICAL CHARACTERISTICS OF UNIDIRECTIONAL COMPOSITE MATERIALS UNDER STATIC LOADING [ISSLEDOVANIE MEKHANICHESKIKH KHARAKTERISTIK ODNONAPRAVLENNYKH KOMPOZITNYKH MATERIALOV PRI STATICHESKOM NAGRUZHENII]
E. V. MESHKOV, V. I. KULIK, A. S. NILOV, Z. T. UPITIS, and A. A. SERGEEV (Leningradskii Mekhanicheskii Institut, Leningrad, USSR; Latviiskaia Akademiia Nauk, Institut Mekhaniki Polimerov, Riga, Latvia) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), May-June 1991, p. 459-467. In Russian. Jun. 1991 9 p In RUSSIAN refs
Copyright

A92-10870
PREVENTION OF EDGE DELAMINATION IN COMPOSITE LAMINATES [PREDOTVRASHCHENIE KROMOCHNOGO RASSLAIVANIIA SLOISTYKH PLASTIKOV]
IU. IU. PEROV (NPO Tekhnologiia, Obninsk, USSR) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), May-June 1991, p. 468-473. In Russian. Jun. 1991 6 p In RUSSIAN refs
Copyright

Ways of preventing edge delamination in polymer composites are examined, with particular attention given to minimizing or eliminating interlayer stress peaks in the edge effect region by varying the layup structure and layer thickness ratios or by using mechanical modifications of the finished product. The effectiveness of using an isotropic adhesive layer in the plane of maximum predicted stresses is evaluated theoretically and experimentally. This method is shown to completely prevent edge delamination and significantly increase the laminate strength with only a slight reduction in stiffness. V.L.

A92-14284
COMPOSITE MATERIALS (HANDBOOK) [KOMPOZITSIONNYE MATERIALY /SPRAVOCHNIK/]
V. V. VASIL'EV, ED. and IU. M. TARNOPOL'SKII, ED. Moscow, Izdatel'stvo Mashinostroenie, 1990, 512 p. In Russian. No individual items are abstracted in this volume. 1990 512 p In RUSSIAN
Copyright

The principles of the development and production of composite materials are reviewed, and reference data are presented on the composition, structure, and properties of some commonly used types of reinforcing fibers and matrix materials, processes for combining them into composite materials, and physicomechanical properties of the resulting composites. The handbook also presents principles of the design and fabrication of composite structures, material processing methods, and types of equipment used. Examples of efficient uses of composite materials in modern structures are included. V.L.

A92-15029
OPTIMAL PROPERTIES AND STRUCTURE OF A HIGH-TEMPERATURE HEAT-STORAGE COMPOSITE [OPTIMAL'NYE SVOISTVA I STRUKTURA KOMPOZITNOGO VYSOKOTEMPERATURNOGO TAV]
M. A. MARINBAKH (AN SSSR, Institut Vysokikh Temperatur, Moscow, USSR) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 29, Sept.-Oct. 1991, p. 893-898. In Russian. Oct. 1991 6 p In RUSSIAN refs
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Criteria are examined for high-temperature heat storage materials using the heat of the phase transition. In addition to lithium fluoride, germanium and silicon-based eutectics are considered among heat-storage materials with a melting temperature of 840-1000 C. The advantages of a composite system with a highly heat-conducting matrix (e.g., graphite), whose pores are filled by a heat-storage material (e.g., a magnesium-silicon eutectic), are demonstrated. For composite components of equal density, a structure with cylindrical pores parallel to the heat flux is shown to be particularly efficient. V.L.

A92-18285
A STUDY OF THE DISINTEGRATION OF COMPOSITE MATERIALS UNDER THE EFFECT OF LASER RADIATION AND SUPERSONIC FLOW OF NITROGEN [ISSLEDOVANIE RAZRUSHENIIA KOMPOZITSIONNYKH MATERIALOV LAZERNYM IZLUCHENIEM I SVERKHZVUKOVYM POTOKOM AZOTA]
A. A. BETEV, V. T. KARPUKHIN, M. M. MALIKOV, and N. I. SHAL'NOVA Fizika i Khimiia Obrabotki Materialov (ISSN 0015-3214), Nov.-Dec. 1991, p. 58-65. In Russian. Dec. 1991 8 p In RUSSIAN refs
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Experiments were carried out to investigate the combined effect of laser radiation and supersonic flow of nitrogen on specimens of composite materials containing a phenol formaldehyde matrix. Results are presented for laminated and porous specimens tested in nitrogen flow at Mach 4.1 and irradiated by a CO2 laser (100-10,000 W/sq cm). It is found that laser radiation accounts for most of the observed mass loss. V.L.

A92-23207
INTERFACES IN POLYMER-POLYMER COMPOSITES
IU. S. LIPATOV (AN USSR, Institut Khimii Vysokomolekuliarnykh Soedinenii, Kiev, Ukrainian SSR) IN: Controlled interphases in composite materials; Proceedings of the 3rd International Conference on Composite Interfaces (ICCI-III), Cleveland, OH, May 21-24, 1990 1990 13 p refs
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The influence of the interface with solid on the thermodynamic state of polymer-polymer composites is discussed. The peculiarities of the phase diagrams of filled blends and the difference in the interaction parameters near the interface and in the bulk of matrix are explained. A model of the structure of the interphase region between solid and polymer blend is proposed. Author

A92-23591
EFFECTIVE STRENGTH PARAMETERS OF MATRIX COMPOSITES [EFFEKTIVNYE PARAMETRY PROCHNOSTI MATRICHNYKH KOMPOZITOV]
V. A. BURIACHENKO, IU. S. SKORBOV, and S. V. GUNIN (NIKhTI, Lyubertsy, USSR) Problemy Prochnosti (ISSN 0556-171X), Dec. 1991, p. 47-51. In Russian. Dec. 1991 5 p In RUSSIAN refs
Copyright
A method has been developed for constructing the effective strength surface of matrix composites from the properties of the components with allowance for the arbitrary anisotropy of the strength, elastic, and geometrical parameters of the components. The method is based on estimating the mean values of the first and second stress tensors for the components of a composite material. Some particular results based on this method, which are consistent with the well-known criteria, are examined. V.L.

A92-25279
ENGINEERING COMPOSITE MECHANICS IN THE USSR [INZHENERNAIA MEKHANIKA KOMPOZITOV V SSSR]
IU. M. TARNOPOL'SKII (AN Latvii, Institut Mekhaniki Polimerov, Riga, Latvia) Oct. 1991 9 p In RUSSIAN refs
Copyright
Recent theoretical and experimental research in the field of engineering composite mechanics conducted in the USSR is briefly reviewed. In particular, attention is given to the micromechanics and macromechanical approaches to the study of composites; composite strength theories; the principle of energy smoothing; and development of generalized methods for the strength analysis of composite structures. The discussion also covers the development of specialized theories accounting for the specific structural properties of composites and studies of the fracture modes of composites. V.L.

A92-25292
EVOLUTIONARY FORM OF PHYSICAL RELATIONS IN TECHNOLOGICAL PROBLEMS OF COMPOSITE MECHANICS [OB EVOLIUTSIONNOI FORME FIZICHESKIKH SOOTNOSHENII V TEKHNOLOGICHESKIKH ZADACHAKH MEKHANIKI KOMPOZITNYKH MATERIALOV]
V. T. TOMASHEVSKII and V. S. IAKOVLEV (Voenno-Morskaia Akademiia, Leningrad, USSR) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), Sept.-Oct. 1991, p. 909-917. In Russian. Oct. 1991 9 p In RUSSIAN refs
Copyright
Based on chemical kinetics laws and basic thermodynamic principles, physical relations are obtained for the polymer matrix with allowance for its thermophysical and mechanical properties during the processing of composite materials. The evolution model of the polymer matrix includes a system of chemical kinetics equations, heat conductivity equations, and equations for the coupling between the stress and strain tensor components, which are the same for the whole process cycle. It is found that there exists an exponential relationship between the properties of a curing polymer matrix and the degree of its conversion. V.L.

A92-27550
EFFECTIVE PARAMETERS OF STATIC CONJUGATED PHYSICOMECHANICAL FIELDS IN MATRIX COMPOSITES [EFFEKTIVNYE PARAMETRY STATICHESKIKH SOPRIAZHENNYKH FIZIKO-MEKHANICHESKIKH POLEI V MATRICHNYKH KOMPOZITAKH]
V. A. BURIACHENKO and V. Z. PARTON (Moskovskii Institut Khimicheskogo Mashinostroeniia, Moscow, Russia) Fiziko-Khimicheskaia Mekhanika Materialov (ISSN 0430-6252), vol. 27, July-Aug. 1991, p. 105-111. In Russian. Aug. 1991 7 p In RUSSIAN refs
Copyright
For a wide class of stationary conjugated fields, the problem of estimating the effective composite parameters is reduced to that of investigating uncoupled fields using structural mechanics methods. The multiparticle method of the effective field is extended to the analysis of static conjugated physicomechanical fields in composites. An illustrative example is presented. V.L.

A92-30374
PROPERTIES OF A FIBER COMPOSITE BASED ON AN INTERMETALLIC MATRIX [SVOISTVA VOLOKNISTOGO KOMPOZITSIONNOGO MATERIALA NA OSNOVE INTERMETALLIDNOI MATRITSY]
A. G. VASIL'EVA, A. V. VOROB'EV, L. M. USTINOV, and V. I. ZHAMNOVA Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriia Mashinostroenie (ISSN 0236-3941), Jan.-Mar. 1991, p. 91-96. In Russian. Mar. 1991 6 p In RUSSIAN refs
Copyright
A study is made of the fracture behavior and mechanical properties of a composite material based on an NiAl matrix reinforced by tungsten wire (wire volume fraction, 10, 30, and 40 percent). It is found that this composite material is characterized by high strength and heat resistance in the temperature range 1200-1300 C and can be used for the manufacture of critical aircraft and rocket engine components. Engineering formulas are obtained which can be used in the design of NiAl/W components. V.L.

A92-30377
DESCRIPTION OF THE NONLINEAR DEFORMATION OF CARBON-BASED COMPOSITES [OPISANIE NELINEINOGO DEFORMIROVANIIA KOMPOZITOV NA OSNOVE UGLERODA]
V. S. ZARUBIN and G. N. KUVYRKIN Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriia Mashinostroenie (ISSN 0236-3941), Oct.-Dec. 1990, p. 11-17. In Russian. Dec. 1990 7 p In RUSSIAN refs
Copyright
The paper presents an approach which, given minimum initial information, makes it possible to describe the nonlinear deformation of orthotropic carbon-based composites with different resistances to tension and compression. Results are presented on the prediction of the behavior of a carbon-based composite under rigid cyclic deformation, taking the differences with respect to tension and compression into account. L.M.

A92-33750
A STUDY OF THE PHYSICOMECHANICAL AND TRIBOLOGICAL PROPERTIES OF HETEROPHASE MATERIALS IN THE SYSTEM SIC-MEB2 [ISSLEDOVANIE FIZIKO-MEKHANICHESKIKH I TRIBOLOGICHESKIKH SVOISTV GETEROFAZNYKH MATERIALOV SISTEMY SIC-MEB2]
V. V. KOVAL'CHUK, A. I. IUGA, R. G. TIMCHENKO, O. N. GRIGOR'EV, V. I. PANIN, and A. D. KOSTENKO (AN Ukrainy, Institut Problem Materialovedeniia, Kiev, Ukraine) Poroshkovaia Metallurgiia (ISSN 0032-4795), Feb. 1992, p. 95-100. In Russian. Feb. 1992 6 p In RUSSIAN refs
Copyright
The effect of additions of TiB2 and ZrB2 on the physicomechanical properties and friction characteristics of silicon carbide was investigated experimentally, and the experimental results were processed statistically. It is found that there exists a correlation between the physicomechanical properties and the friction behavior of silicon carbide ceramics. The results of the study may be used in developing ceramics for structural and tool applications. V.L.

A92-36608
POLARIZATION METHODS IN THE MECHANICS OF COMPOSITE MATERIALS [POLIARIZATSIONNYE METODY MEKHANIKI KOMPOZITSIONNYKH MATERIALOV]
VASILII P. NETREBKO and IVAN P. VASIL'CHENKO Moscow, Izdatel'stvo Moskovskogo Universiteta, 1990, 160 p. In Russian. 1990 160 p In RUSSIAN refs
(ISBN 5-211-00948-7) Copyright
The physical principles and practical implementations of methods for solving problems in composite mechanics are

at the macroscopic levels is observed in essentially homogeneous flows of gases and gas mixtures, both combustible and inert. In supersonic flows, the synergistic structures mechanically affect solid surfaces in direct contact with the gas. Here, experimental results are presented on the damage of solids in the case of plane detonation in the presence of cellular structures and in the case of the cylindrical reflection of a shock wave with gasdynamic fluctuations. V.L.

A92-25997
AN EXPERIMENTAL STUDY OF SUPERSONIC H2 COMBUSTION AND HEAT TRANSFER IN A CIRCULAR DUCT [EKSPERIMENTAL'NOE ISSLEDOVANIE GORENIIA H2 I TEPLOOTVODA V KOL'TSEVOM KANALE PRI SVERKHZVUKOVOI SKOROSTI]
R. V. ALBEGOV, V. A. VINOGRADOV, G. G. ZHADAN, and S. A. KOBYZHSKII Fizika Goreniia i Vzryva (ISSN 0430-6228), vol. 27, Nov.-Dec. 1991, p. 24-29. In Russian. Dec. 1991 6 p In RUSSIAN refs
Copyright
Results of an experimental study of supersonic H2 combustion and heat transfer in a circular duct simulating the intake and the combustion chamber of a ramjet engine are reported. Stable operation regions for the intake and the combustion chamber are determined for various fuel distributions. The level of heat transfer to the duct walls and combustion efficiency are calculated as a function of the varying flow in the duct. V.L.

A92-26000
INSTRUMENTS AND APPARATUS FOR CONTACT DIAGNOSTICS AND THEIR USE IN THE STUDY OF HIGH-TEMPERATURE TWO-PHASE FLOWS [PRIBORY I USTANOVKI KONTAKTNOI DIAGNOSTIKI I IKH ISPOL'ZOVANIE V ISSLEDOVANII VYSOKOTEMPERATURNYKH DVUKHFAZNYKH POTOKOV]
N. N. IVANOV and A. N. IVANOV Fizika Goreniia i Vzryva (ISSN 0430-6228), vol. 27, Nov.-Dec. 1991, p. 87-101. In Russian. Dec. 1991 15 p In RUSSIAN refs
Copyright
The contact and remote (e.g., optical) diagnostic methods that are currently used for studying the condensed combustion products of rocket engines are briefly reviewed, and their advantages and disadvantages identified. It is noted that the largest amount of significant data on the disperse phase characteristics in studies of the high-temperature combustion products of rocket engines has been obtained using contact diagnostic methods. The instrumentation and equipment used in such studies are discussed. V.L.

A92-26702
SELF-PROPAGATING HIGH-TEMPERATURE SYNTHESIS - TWENTY YEARS OF SEARCH AND FINDINGS
A. G. MERZHANOV (AN SSSR, Institut Strukturnoi Makrokinetiki, Chernogolovka, USSR) IN: Combustion and plasma synthesis of high-temperature materials 1990 53 p refs
Copyright
An historical account of the development of the self-propagating high-temperature synthesis (SHS) method in the Soviet Union is presented. Accomplishments along theoretical and applied directions in the synthesis of a large number of materials are described. The uniqueness and advantages of the SHS process and its adaptability in the processing of materials are discussed. Author

A92-33688
CONDITIONS OF YBA2CU3O(7-DELTA) FORMATION FROM CUO, Y2O3, AND BACO3 [USLOVIIA OBRAZOVANIIA YBA2CU3O/7-DELTA/ IZ CUO, Y2O3 I BACO3]
A. A. FOTIEV and S. N. KOSHCHEEVA (Rossiiskaia Akademiia Nauk, Institut Khimii Tverdogo Tela, Yekaterinburg, Russia) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 322, no. 2, 1992, p. 333-338. In Russian. 1992 6 p In RUSSIAN refs
Copyright
The thermodynamically possible reactions occurring in a mixture of Y2O3, CuO, and BaCO3 during heating in the process of YBa2Cu3O(7-delta) ceramic synthesis are examined with reference to results of X-ray diffraction analysis, differential thermal analysis, thermogravimetry, and electron microscopy. It is shown that the formation of YBa2Cu3O(6.5) becomes the dominant process at temperatures above 900 C, with the size of the yttrium phase crystals exceeding by an order of magnitude or more the size of the crystals of the initial components. This effect is attributed to process acceleration at the interface at the moment of formation of the new phase crystals due to heat released during the reaction of the oxides. V.L.

A92-40617
MODELING OF COMBUSTION WITH DELAY IN A SOLID-PROPELLANT ROCKET ENGINE [O MODELIROVANII PROTSESSOV GORENIIA S ZAPAZDYVANIEM V RDTT]
IU. S. SHATALOV, I. N. DOTSENKO, and I. M. URAKAEV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1991, p. 80-84. In Russian. 1991 5 p In RUSSIAN refs
Copyright
The problem of anomalous phenomena in solid-propellant rocket engines is examined in the light of the available new data on combustion processes with delay. The combustion process is modeled using a gas mass conservation equation, a state equation for an ideal gas, and an equation for the rate of combustion with delay. Results are presented for three particular cases: the case of a small delay, discontinued combustion, and the transient regime.

A92-43461
RADIATION-DRIVEN TRANSIENT BURNING - EXPERIMENTAL RESULTS
V. E. ZARKO, V. N. SIMONENKO, and A. B. KISKIN (Russian Academy of Sciences, Institute of Chemical Kinetics and Combustion, Novosibirsk, Russia) IN: Nonsteady burning and combustion stability of solid propellants 1992 36 p refs
Copyright
The importance of self-irradiation in the energy balance of the reacting surface during unsteady combustion is considered with experimental treatment given to transient burning phenomena. Models of radiation-augmented combustion are discussed, and experimental set-ups are described for direct study. Quantitative predictions of this combustion are examined, and relationships are set forth between burning-rate response to pressure and/or radiation perturbations. The Zeldovich-Novozhilov theory is employed to formulate the problem of radiation-driven transient burning, and the experimental data indicate that resonant properties and temperature sensitivity characterize the burning rate. It is shown that powerful lasers, homogeneously distributed, should be used to study the radiation-driven burning rate. The fundamental laws governing the combustion process can be investigated by studying solid propellants under the influence of thermal radiation. C.C.S.

A92-43776
CONVECTIVE COMBUSTION OF POROUS COMPRESSIBLE PROPELLANTS
N. N. SMIRNOV and I. D. DIMITRIENKO (Moscow State University, Russia) Combustion and Flame (ISSN 0010-2180), vol. 89, no. 3-4, June 1992, p. 260-270. Jun. 1992 11 p refs
Copyright
This abstract describes the combustion of solid porous propellants, focusing on burning regimes characterized by a convective mechanism of propagation. A new mathematical model of the dynamics of multiphase chemically reacting media, including interphase heat and mass transfer, is developed in the course of the investigation. Mathematical simulations of the process prove theoretically that there exists a self-sustained combustion regime, driven by convection. This regime is supersonic with respect to the gas phase and subsonic with respect to the condensed phase. Author

26

METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

A92-10795
EFFECT OF PLASTIC DEFORMATION ON THE TEXTURE AND PROPERTIES OF SINGLE CRYSTALS AND POLYCRYSTALS OF PT-3VKT ALLOY [VLIIANIE PLASTICHESKOI DEFORMATSII NA TEKSTURU I SVOISTVA MONO- I POLIKRISTALLOV SPLAVA PT-3VKT]
A. A. BRIUKHANOV, A. R. GOKHMAN, IU. G. MIKHAILIVSKII, and V. M. TSMOTS' (Odesskii Gosudarstvennyi Pedagogicheskii Institut, Odessa; Drogobychskii Gosudarstvennyi Pedagogicheskii Institut, Drogobych, Ukrainian SSR) Fizika Metallov i Metallovedenie (ISSN 0015-3230), May 1991, p. 175-180. In Russian. May 1991 6 p In RUSSIAN refs
Copyright

The study is concerned with the effect of cold rolling on the texture and the anisotropy of the Young modulus, magnetic susceptibility, and specific reistance of sheets of alpha titanium alloy PT-3Vkt. Data on the anisotropy of the Young modulus and magneic susceptibility together with the corresponding integral texture characteristics were used to calculate the magnetic susceptibility tensor components and some characteristics of the compliance tensor of PT-3Vkt single crystals. The magnetic characteristics are found to vary only slightly. The Young moduli are determined in the normal direction, and the textural strengthening coefficients are calculated for different rolling reductions. V.L.

A92-10846
EFFECT OF INTERSTITIAL IMPURITIES ON THE FRACTURE TOUGHNESS OF DUCTILE TITANIUM ALLOYS. I [VLIIANIE PRIMESEI VNEDRENIIA NA TRESHCHINOSTOIKOST' PLASTICHNYKH TITANOVYKH SPLAVOV. I]
V. T. TROSHCHENKO, V. V. POKROVSKII, V. L. IARUSEVICH, V. I. MIKHAILOV, and V. A. SHER (AN USSR, Institut Problem Prochnosti, Kiev, Ukrainian SSR) Problemy Prochnosti (ISSN 0556-171X), Aug. 1991, p. 23-30. In Russian. Aug. 1991 8 p In RUSSIAN refs
Copyright

A study is made of the effect of nitrogen and oxygen impurities in concentrations of 0.05-0.35 percent on the mechanical properties and fracture toughness of a ductile titanium alloy, 2V. It is found that the fracture toughness characteristics of the alloy change nonmonotonically with nitrogen and oxygen contents. A quantitative relation is established between impurity contents and geometrical parameters of the lamellar structure. Expressions are obtained which make it possible to estimate the fracture toughness of the alloy from the known hardness and geometrical parameters of the structure. V.L.

A92-12187
POSSIBILITY OF THE DEVELOPMENT OF WELDABLE ALLOYS BASED ON THE SYSTEM AL-CU-LI [VOZMOZHNOST' SOZDANIIA SVARIVAEMYKH SPLAVOV NA OSNOVE SISTEMY AL-CU-LI]
I. N. FRIDLIANDER, A. M. DRITS, and T. V. KRYMOVA (NPO Vsesoiuznyi Nauchno-Issledovatel'skii Institut Aviatsionnykh Materialov, Moscow, USSR) Metallovedenie i Termicheskaia Obrabotka Metallov (ISSN 0026-0819), no. 9, 1991, p. 30-32. In Russian. 1991 3 p In RUSSIAN refs
Copyright

Results of a study of the weldability of Al-Cu-Li alloys are reported, and the following promising alloying regions for weldable alloys are recommended: 5.5-6.5 pct Cu, 0.8-1.4 pct Li and 2.5-3.5 pct Cu, and 1.9-2.5 pct Li. The favorable effect of small additions of scandium on the weldability and mechanical properties of

A92-46550
VARYING THE DEFORMATION TEMPERATURE OF ALPHA-TITANIUM - MECHANICAL AND SUBSTRUCTURAL ASPECTS [IZMENENIE TEMPERATURY DEFORMIROVANIIA ALPHA-TITANA - MEKHANICHESKII I SUBSTRUKTURNYI ASPEKTY]
A. R. SMIRNOV and V. A. MOSKALENKO (AN Ukrainy, Fiziko-Tekhnicheskii Institut Nizkikh Temperatur, Kharkov, Ukraine) Metallofizika (ISSN 0204-3580), vol. 14, no. 1, Jan. 1992, p. 9-15. In Russian. Jan. 1992 7 p In RUSSIAN refs
Copyright

The effect of preliminary plastic deformation at a temperature of T1 on the mechanical properties of alpha-Ti at a temperature of T2 in the 4.2-293 K range was investigated for different temperature-variation schemes. A relation between the substructure that is formed and the level of deformation stress is shown. As a result of the combination of prestraining at 293 K and subsequent deformation at low temperature, substructures that are specific to this regime appear: superimposed systems of reorientation bands and twins. L.M.

A92-48986#
EXPERIMENTAL INVESTIGATION OF LIQUID CARBONHYDROGEN FUEL COMBUSTION IN CHANNEL AT SUPERSONIC VELOCITIES
V. VINOGRADOV, S. KOBYZHSKII, and M. PETROV (Tsentral'nyi NII Aviatsionnogo Motorostroeniia, Moscow, Russia) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 28th, Nashville, TN, July 6-8, 1992. 9 p. Jul. 1992 9 p refs
(AIAA PAPER 92-3429) Copyright

An experimental investigation of liquid hydrocarbon fuel ignition and combustion stabilization at supersonic velocities in the 2D channel was conducted to study the working process in a scramjet. The model was tested in CIAM's facility at freestream Mach number M of 6.0 and 1500 K temperature. Some variants of combustors with different kerosene injectors and flameholders were studied. Hydrogen was used for ignition and stabilization of kerosene burning. The conditions were found under what the kerosene combustion was successful in a combustor with constant area and expanding sections after the hygrogen stopped being injected. Distributions of aerothermodynamic parameters along the duct, data on stabilization, and joint inlet-combustor work are discussed. Author

N92-70263 Academy of Sciences of the Ukrainian SSR, Kharkov. Fiziko-Tekhnicheskij Inst.
AUTOMATION OF DIAGNOSTIC SYSTEMS FOR LASER FLUORESCENCE SPECTROSCOPY
P. N. ZHMURIN, A. N. LETUCHIJ, V. A. TSUBIN, and D. A. SHONO 1989 12 p In RUSSIAN
(DE92-609441; KFTI-89-36) Avail: CASI HC A03/MF A01

An algorithm of a plasma laser fluorescent spectroscopy automation system, construction principles and capabilities of a problematically oriented program packet for control of an equipment complex, data acquisition and processing are described. Structurally, the automation system is realized in the MERA-60 microcomputer and SM-1420 minicomputer. DOE

Al-Cu-Li alloys is demonstrated. The properties of a new high-strength weldable alloy, 1460, at normal and cryogenic temperatures are presented. The strength and ductile characteristics of 1460 alloy are shown to improve as the temperature decreases to levels as low as -269 C. V.L.

A92-13765
PHYSICOCHEMICAL CONDITION OF THE SURFACE LAYERS AND SERVICE-RELATED PROPERTIES OF VT18U ALLOY TREATED BY A HIGH-POWER ION BEAM [FIZIKO-KHIMICHESKOE SOSTOIANIE POVERKHNOSTNYKH SLOEV I EKSPLUATATSIONNYE SVOISTVA SPLAVA VT18U, PODVERGNUTOGO VOZDEISTVIIU MOSHCHNOGO IONNOGO PUCHKA]
A. N. DIDENKO, V. A. SHULOV, G. E. REMNEV, A. E. STRYGIN, A. D. POGREBNIAK, N. A. NOCHOVNAIA, and IU. D. IAGODKIN Fizika i Khimiia Obrabotki Materialov (ISSN 0015-3214), Sept.-Oct. 1991, p. 14-23. In Russian. Oct. 1991 10 p In RUSSIAN refs
Copyright

The chemical composition and the structural-phase state of the surface layer of VT18U titanium alloy were investigated following irradiation by a high-power ion beam with current densities of 20-160 A/sq cm and diffusion annealing and also after production testing. It is found that the ion-beam treatment results in a 10-percent increase in the fatigue limit of the alloy, a factor of 20 increase in the fatigue life at 500 C and 375 MPa, a factor of 2.3 increase in high-temperature strength at 550 C, and a factor of 1.8 increase in the resistance to dust erosion. V.L.

A92-14282
THEORETICAL AND PRACTICAL METALLURGY OF MANGANESE [TEORIIA I PRAKTIKA METALLURGII MARGANTSA]
N. P. LIAKISHEV, ED. Moscow, Izdatel'stvo Nauka, 1990, 208 p. In Russian. No individual items are abstracted in this volume. 1990 208 p In RUSSIAN
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The papers contained in this volume focus on the physicochemical properties of manganese-based systems. Topics discussed include the mechanism and kinetics of reactions involved in the production of manganese alloys, methods of manganese ore concentration and dephosphorization, and theory and practice of the production of low-phosphorus manganese alloys. The discussion also covers ways of increasing manganese extraction, refinement of manganese production processes, and expansion of the raw material resources. V.L.

A92-14283
METALLIC SINGLE CRYSTALS [METALLICHESKIE MONOKRISTALLY]
G. G. DEVIATYKH, ED. and G. S. BURKHANOV, ED. Moscow, Izdatel'stvo Nauka, 1990, 248 p. In Russian. No individual items are abstracted in this volume. 1990 248 p In RUSSIAN
Copyright

The theoretical and practical aspects of the growth of single crystals of refractory and less common metals, including crystals of specified shape, are discussed with reference to recent research in this field. The mechanical, optical, electrical, and superconducting properties of the crystals are examined, and conditions are determined under which anomalies in the physical properties of the crystals are observed. Data are also presented on the effect of the impurity composition and structural perfection on the properties of single crystals. V.L.

A92-18227
PREDICTION OF THE LONG-TERM STRENGTH OF REFRACTORY METALS AND ALLOYS [PROGNOZIROVANIE DLITEL'NOI PROCHNOSTI TUGOPLAVKIKH METALLOV I SPLAVOV]
VLADIMIR V. KRIVENIUK Kiev, Izdatel'stvo Naukova Dumka, 1990, 248 p. In Russian. 1990 248 p In RUSSIAN refs
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Various approaches to the prediction of the high-temperature creep and long-term strength of high-melting metal materials (e.g., V, Nb, Ta, Cr, Mo, W, and Rh) are examined. A theory is developed which provides a unified description of the instantaneous and short-term deformation, creep, stress relaxation, and long-term strength behavior of refractory metals and alloys. The possible use of data on the properties of refractory materials for improving the accuracy of predicting the properties of high-melting metals is discussed. V.L.

A92-18237
CHARACTERISTICS OF THE EVOLUTION OF EUTECTOID REACTIONS IN BINARY SYSTEMS [ZAKONOMERNOSTI RAZVITIIA EVTEKTOIDNYKH REAKTSII V BINARNYKH SISTEMAKH]
RASHIDA K. AUBAKIROVA, ANTONINA S. DEGTIAREVA, and ALEKSANDR A. PRESNIAKOV Alma-Ata, Izdatel'stvo Nauka, 1990, 168 p. In Russian. 1990 168 p In RUSSIAN refs
Copyright

The available theoretical and experimental data on eutectic and eutectoid transformations in systems with phases of varying crystallochemical nature are generalized. A novel approach to the evolution of eutectic and eutectoid reactions is proposed whereby these reactions are treated from the standpoint of the multistage decomposition of an unstable liquid or solid chemical compounds due to separating and equalizing diffusion. The book is recommended as a practical guide in developing new thermal and thermomechanical treatments for a large group of alloys, composites, and amorphous materials whose compositions are close to eutectic or eutectoid concentrations. V.L.

A92-18287
CHANGES IN THE STRUCTURE AND PROPERTIES OF THE SURFACE LAYERS OF TITANIUM DURING LASER ALLOYING [IZMENENIE STRUKTURY I SVOISTV POVERKHNOSTNYKH SLOEV TITANA PRI LAZERNOM LEGIROVANII]
A. N. BEKRENEV and E. A. MOROZOVA Fizika i Khimiia Obrabotki Materialov (ISSN 0015-3214), Nov.-Dec. 1991, p. 117-123. In Russian. Dec. 1991 7 p In RUSSIAN refs
Copyright

The physicomechanical properties of the surface layers of titanium were investigated by X-ray diffraction analysis, electron probe microanalysis, and microhardness measurements during laser alloying by chromium, manganese, iron, and nickel. In particular, the structure and properties of the surface layer during the laser alloying of titanium by nickel and iron are analyzed for varying rates of laser treatment. Optimal treament conditions, resulting in the formation of a uniform fine dispersed structure with improved physicomechanical properties, are determined. V.L.

A92-18289
NITRIDING OF A NICKEL ALLOY AND ITS PROPERTIES [AZOTIROVANIE NIKELEVOGO SPLAVA I EGO SVOISTVA]
IU. V. LEVINSKII, A. A. NUZHDIN, V. P. ZHABIN, V. B. LATYSHEV, and T. L. TSUPRUN Fizika i Khimiia Obrabotki Materialov (ISSN 0015-3214), Nov.-Dec. 1991, p. 145-149. In Russian. Dec. 1991 5 p In RUSSIAN refs
Copyright

The internal nitriding of a nickel-base system alloyed by chromium and titanium was investigated experimentally. Results of a metallographic analysis are presented, and the composition of the nitride particles is investigated. The microhardness of the nitrided material and its high-temperature mechanical properties are determined. The alloy oxidation kinetics is examined, and an expression is obtained for the temperature dependence of the nitrogen penetration factor. V.L.

A92-18295
BEHAVIOR OF D16 AND V65 ALLOYS UNDER DYNAMIC AGING [POVEDENIE SPLAVOV D16 I B65 PRI DINAMICHESKOM STARENII]
V. F. GAIDUCHENIA and A. M. SHNEIBERG Metally (ISSN

0568-5303), Nov.-Dec. 1991, p. 107-111. In Russian. Dec. 1991 5 p In RUSSIAN refs
Copyright

The dynamic aging kinetics of two heat-treatable aluminum alloys, D16 and V65, was investigated experimentally at various temperatures. The experiments included measuring hardness after aging and determining the activation energy during the aging treatment. The increase in hardness observed after aging is attributed to the formation of Guinier-Preston zones at dislocations, whose nucleation is initiated by the applied stress. V.L.

A92-22752
TITANIUM ALLOYS IN THE USSR

V. V. TETIUKHIN (VIAM, Moscow, Russia) IN: Titanium 1990: Products and applications; Proceedings of the International Conference, Buena Vista, FL, Sept. 30-Oct. 3, 1990. Vol. 1 1990 10 p
Copyright

Studies conducted with AES, XRD, and SEM, have indicated that nitrogen-rich gas-saturated defects can be incurred not only at the Ti-alloy ingot-formation stage, but also in the initial deformation that is conducted during rolling and forging processes. An account is presently given of the precautionary steps that have been devised in the USSR to deal with these difficulties in a wide variety of Ti alloys, as well as of the development of ignition (rapid oxidation) resistant Ti alloys for gas turbine high pressure compressors, Ti-sphere filters, and hybrid Ti/carbon fiber-reinforced polymer-matrix composites. O.C.

A92-22756
THE EFFECT OF RAPID HEATING ON BETA-GRAIN SIZE AND FATIGUE PROPERTIES OF (ALPHA + BETA) TITANIUM ALLOYS

O. M. IVASISHIN, P. E. MARKOVSKII (AN Ukrainy, Institut Metallofiziki, Kiev, Ukraine), L. WAGNER, and G. LUETJERING (Hamburg, Technische Universitaet, Federal Republic of Germany) IN: Titanium 1990: Products and applications; Proceedings of the International Conference, Buena Vista, FL, Sept. 30-Oct. 3, 1990. Vol. 1 1990 12 p refs
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Direct electrical rapid heating was utilized to produce beta-grain sizes as small as about 50 microns in fully lamellar Ti-6Al-4V and VT6 alloys having a fine-grained equiaxed starting microstructure. For comparison, conventional furnace beta-heat treatments resulting in the usual beta-grain sizes of about 500 microns were also performed. Rotating-beam fatigue testing was done on the small-grained and large-grained materials of Ti-6Al-4V and VT6 in laboratory air at room temperature and the 10 exp 7 cycles fatigue strengths of the various conditions were evaluated. Fatigue-crack nucleation and microcrack propagation were studied by optical microscopy. The effect of beta-grain size on LCF and HCF behavior is discussed in terms of the resistance to fatigue crack nucleation and microcrack propagation. Author

A92-22774
HIGH-SPEED METHODS OF HEAT TREATMENT OF TITANIUM ALLOYS

A. I. GORDIENKO (AN BSSR, Fiziko-Tekhnicheskii Institut, Minsk, Belorussian SSR), M. IA. BRUN (Vsesoiuznyi Institut Legkikh Splavov, Moscow, USSR), V. V. IVASHKO (AN BSSR, Fiziko-Tekhnicheskii Institut, Minsk, Belorussian SSR), and L. A. ELAGINA (Vsesoiuznyi Institut Legkikh Splavov, Moscow, USSR) IN: Titanium 1990: Products and applications; Proceedings of the International Conference, Buena Vista, FL, Sept. 30-Oct. 3, 1990. Vol. 2 1990 10 p refs
Copyright

Results are presented from an investigation of the property-microstructure relationships of Ti alloys subjected to rapid heating by means of either induction or resistance. Such processing is shown to be useful in softening-annealing of cold-worked alpha- and beta-Ti alloys, as well as for grain size/structure-controlling heat-treatment of two-phase alloys for improving high-temperature properties. The method is also applicable to volume and surface heat-hardening of alpha + beta Ti alloys, and in the development of refining processes for coarse-grained structures. O.C.

A92-22776
TITANIUM ALLOYS WITH SHAPE MEMORY EFFECT AND THEIR PROSPECTIVE TECHNOLOGICAL APPLICATION

A. A. IL'IN, M. IU. KOLLEROV, and S. V. SKVORTSOVA (Moskovskii Aviatsionnyi Tekhnologicheskii Institut, Moscow, USSR) IN: Titanium 1990: Products and applications; Proceedings of the International Conference, Buena Vista, FL, Sept. 30-Oct. 3, 1990. Vol. 2 1990 9 p refs
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While the 50-90 percent shape-memory-effect (SME) recovery of Ti alloys renders them inferior to TiNi-base alloys in structural applications where shape recovery proceeds in the room temperature to 100 C range, Ti alloys become indispensable in higher-than-100 C applications. The Ti SME alloys' low density and lower-than-TiNi SME alloy costs are presently shown to render them highly attractive in such aerospace applications as cryophite joints. O.C.

A92-22780
POSSIBILITIES OF USING MICROSTRUCTURAL FACTOR FOR IMPROVEMENT OF MECHANICAL PROPERTIES OF ALPHA + BETA TITANIUM ALLOYS

N. F. ANOSHKIN, G. A. BOCHVAR, and M. IA. BRUN (Vsesoiuznyi Institut Legkikh Splavov, Moscow, USSR) IN: Titanium 1990: Products and applications; Proceedings of the International Conference, Buena Vista, FL, Sept. 30-Oct. 3, 1990. Vol. 2 1990 8 p refs
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The present examination of industrial fabrication-related aspects of alpha + beta Ti alloy microstructure-mechanical properties relations notes that the structural geometry and service efficiency-related aspects of the components to be fabricated must be fundamental considerations in microstructural phase choices. Microstructural optimization should regulate not only the morphology of the primary alpha phase, but also the dimension of various structural elements. A determination is made of regularities emerging in the influence of alpha + beta alloys' properties as a result of microstructural parameters. O.C.

A92-23323
MECHANICAL BEHAVIOUR OF FINE GRAINED TIAL INTERMETALLIC COMPOUND. I - SUPERPLASTICITY. II - DUCTILE-BRITTLE TRANSITION

R. M. IMAEV, O. A. KAIBYSHEV, and G. A. SALISHCHEV (AN SSSR, Institut Problem Sverkhplastichnosti Metallov, Ufa, USSR) Acta Metallurgica et Materialia (ISSN 0956-7151), vol. 40, March 1992, p. 581-587, 589-595. Mar. 1992 14 p refs
Copyright

A92-23487
CHANGES IN THE MECHANICAL CHARACTERISTICS OF METALS DURING ALLOYING AND IRRADIATION AS A FUNCTION OF LATTICE DEFECT DENSITY AND GRAIN SIZE [IZMENENIE MEKHANICHESKIKH KHARAKTERISTIK METALLOV PRI LEGIROVANII I OBLUCHENII KAK FUNKTSIIA PLOTNOSTI DEFEKTOV KRISTALLICHESKOI RESHETKI I RAZMERA ZEREN]

V. V. GERASIMOV, V. V. GERASIMOVA, and A. G. SAMOILOV Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 320, no. 6, 1991, p. 1375-1379. In Russian. 1991 5 p In RUSSIAN refs
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A92-25509
INFLUENCE OF RAPID QUENCHING OF THE MELT ON STRUCTURE AND PROPERTIES OF MARAGING STEEL

T. A. CHERNYSHOVA and T. V. LIUL'KINA (AN SSSR, Institut Metallurgii, Moscow, USSR) Journal of Materials Science (ISSN

0022-2461), vol. 27, Feb. 1, 1992, p. 580-586. 1 Feb. 1992 7 p refs
Copyright

Peculiarities of structure, properties and phase transformations in the maraging steel were investigated while quenching from the liquid state. Depending on the solidification rates and subsequent cooling, the formation of highly dispersed structures in the solid phase was possible. The structures were of the following types: fully martensite, fully ferrite; a mixture of ferrite and martensite or martensite and austenite. Author

A92-25953
STRUCTURE AND TEXTURE FORMATION IN A PSEUDO-ALPHA TITANIUM ALLOY DURING ROLLING IN THE (ALPHA+BETA) REGION [FORMIROVANIE STRUKTURY I TEKSTURY PSEVDO-ALPHA-SPLAVA TITANA PRI PROKATKE V /ALPHA+BETA/-OBLASTI]

I. N. RAZUVAEVA, A. A. BABAREKO, V. N. KOPYLOV, G. V. MEDVEDEVA, and N. M. DOBRODEEVA (Tsentral'nyi NII Konstruktsionnykh Materialov 'Prometei', St. Petersburg, Russia)
Fizika Metallov i Metallovedenie (ISSN 0015-3230), Nov. 1991, p. 99-107. In Russian. Nov. 1991 9 p In RUSSIAN refs
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Studies of the microstructure and texture of pseudo-alpha titanium alloys deformed in the alpha-beta region demonstrate the existence of a relationship between the structure type and the morphological features of the texture. The effect of the dynamic recrystallization of the beta phase on the evolution of the structural state of titanium alloys is examined. V.L.

A92-25954
EFFECT OF SILICIDE PARTICLE PRECIPITATION ON THE PROPERTIES OF A DUAL-PHASE TITANIUM ALLOY [VLIIANIE VYDELENIIA SILITSIDNYKH CHASTITS NA SVOISTVA DVUKHFAZNOGO TITANOVOGO SPLAVA]

A. A. POPOV, O. A. ELKINA, and A. V. TRUBOCHKIN (Ural'skii Politekhnicheskii Institut; AN SSSR, Institut Fiziki Metallov, Yekaterinburg, USSR)
Fizika Metallov i Metallovedenie (ISSN 0015-3230), Nov. 1991, p. 129-135. In Russian. Nov. 1991 7 p In RUSSIAN refs
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A study is made of the effect of complex titanium and zirconium silicides on the toughness of a dual-phase titanium alloy, VT9. It is shown that the precipitation of silicide particles occurs during slow heating from temperatures above 950 C and during aging. Brief isothermal aging in the range 700-900 C leads to the formation of (Ti, Zr)5Si3 particles; further isothermal holding leads to the transformation of these particles to the more silicon-enriched (Ti, Zr)6Si3 silicide. V.L.

A92-25955
TEXTURE AND MECHANICAL PROPERTIES OF VT32 TITANIUM ALLOY [TEKSTURA I MEKHANICHESKIE SVOISTVA TITANOVOGO SPLAVA BT32]

R. A. ADAMESKU, A. I. GORDIENKO, R. S. NOVIK, and M. V. FROLOVA (Ural'skii Politekhnicheskii Institut, Yekaterinburg, Russia)
Fizika Metallov i Metallovedenie (ISSN 0015-3230), Nov. 1991, p. 188-191. In Russian. Nov. 1991 4 p In RUSSIAN refs
Copyright

The texture formation characteristics and mechanical properties of cold-rolled sheets of VT32 titanium alloy were investigated following in-furnace and rapid heating. It is shown that rapid heating shifts the active recrystallization region to higher temperatures without changing the mechanism of texture formation. Rapid heating is also shown to expand the temperature interval (1050-1200 C) in which stable properties (tensile strength, 900-920 N/sq mm; elongation, 15 percent) are obtained. V.L.

A92-27483
STRUCTURAL MAXIMUM OF THE STRENGTH AND DUCTILITY OF TWO-PHASE BE-AL MATERIALS [STRUKTURNII MAKSIMUM MITSNOSTI I PLASTICHNOSTI DVOFAZNIKH MATERIALIV BE-AL]

B. O. MOVCHAN and A. A. CHEVICHELOV (AN Ukrainy, Institut Elektrozvariuvannia, Kiev, Ukraine) Akademiia Nauk Ukrains'koi RSR, Dopovidi, Matematika, Prirodoznavstvo, Tekhnichni Nauki (ISSN 0868-8052), March 1991, p. 71-73. In Ukrainian. Mar. 1991 3 p In UKRAINIAN refs
Copyright

Experimental results are presented on the relationship between the dimensional and structural parameters of two-phase Be-Al materials, on the one hand, and the mechanical properties of these materials, on the other. It is found that the maximum strength and ductility are achieved when the free distance between the particles is approximately equal to the mean distance between the particles. V.L.

A92-30258
EFFECT OF HYDROGEN ON THE PHASE COMPOSITION AND PHYSICOMECHANICAL PROPERTIES OF V-1 MEMBRANE ALLOY [VLIIANIE VODORODA NA FAZOVYI SOSTAV I FIZIKO-MEKHANICHESKIE SVOISTVA MEMBRANNOGO SPLAVA B-1]

F. N. BERSENEVA, I. A. MIKHAILOVA, and N. I. TIMOFEEV (AN SSSR, Institut Mashinovedeniia, Sverdlovsk, USSR) Fizika Metallov i Metallovedenie (ISSN 0015-3230), Aug. 1991, p. 149-153. In Russian. Aug. 1991 5 p In RUSSIAN refs
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Changes in the phase composition and physicomechanical properties of a multicomponent membrane alloy, V-1, saturated by hydrogen, were investigated experimentally using X-ray diffraction analysis and mechanical testing. It is found that the introduction of hydrogen into the alloy leads to the formation of a hydride beta-phase. It is also found that the hydrogen saturation of B-1 alloy does not result in embrittlement. V.L.

A92-30259
MECHANICAL PROPERTIES OF VT20 TITANIUM ALLOY IN DIFFERENT INITIAL STATES AND WITH DIFFERENT HYDROGEN CONTENTS [MEKHANICHESKIE SVOISTVA TITANOVOGO SPLAVA VT20 S RAZLICHNYM ISKHODNYM SOSTOIANIEM I SODERZHANIEM VODORODA]

E. G. PONIATOVSKII, O. N. SEN'KOV, and I. O. BASHKIN (AN SSSR, Institut Fiziki Tverdogo Tela, Moscow, USSR) Fizika Metallov i Metallovedenie (ISSN 0015-3230), Aug. 1991, p. 191-197. In Russian. Aug. 1991 7 p In RUSSIAN refs
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The structure and mechanical properties of VT20 titanium alloy were investigated in the temperature range 600-850 C and at room temperature as a function of hydrogenation (0.35 mss pct H), deformation under the conditions of hydrogen-induced softening, and dehydrogenation. The observed softening effect at 600-850 C is attributed mainly to the presence of hydrogen and its effect on the relaxation processes accompanying deformation and fracture, rather than being related to the crystal structure parameters. V.L.

A92-30262
KINETICS OF STRUCTURAL CHANGES, DIFFUSION PROCESSES, AND MECHANICAL PROPERTIES OF TITANIUM ALLOY OF THE TRANSITION CLASS FOLLOWING A THERMAL CYCLING TREATMENT [KINETIKA STRUKTURNYKH IZMENENII, PROTSESSY DIFFUZII I MEKHANICHESKIE SVOISTVA TITANOVYKH SPLAVOV PEREKHODNOGO KLASSA POSLE TERMOTSIKLICHESKOI OBRABOTKI]

S. Z. BOKSHTEIN, IU. I. ZAKHAROV, N. P. ZIULINA, and O. V. MARKOVICH (NPO VIAM, Moscow, Russia) Fizika Metallov i Metallovedenie (ISSN 0015-3230), Sept. 1991, p. 155-161. In Russian. Sep. 1991 7 p In RUSSIAN refs
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The kinetics of beta phase recrystallization and polygonization in a titanium alloy of the transition class, VT22, was investigated after a thermal cycling treatment and also after 20-, 40-, and 60-percent deformation followed by anneals of different durations at 820-860 C. It is found that, during both treatments, the structural changes are qualitatively similar: recrystallization follows polygonization and is realized through subgrain coalescence. Results of a quantitative diffusion analysis are presented and shown to be consistent with the structural changes and changes in the mechanical properties of the alloy. V.L.

A92-30266
EFFECT OF THE SPECIMEN GEOMETRICAL PARAMETERS ON THE MECHANICAL PROPERTIES AND ACOUSTIC EMISSION OF AL-MG ALLOYS UNDER CONDITIONS OF INTERMITTENT FLOW [VLIIANIE GEOMETRICHESKIKH PARAMETROV OBRAZTSA NA MEKHANICHESKIE SVOISTVA I AKUSTICHESKUIU EMISSIIU PRI PRERYVISTOI TEKUCHESTI V AL-MG SPLAVAKH]
M. M. KRISHTAL and D. L. MERSON (Tol'iattinskii Politekhnicheskii Institut, Tolyatti, Russia) Fizika Metallov i Metallovedenie (ISSN 0015-3230), Oct. 1991, p. 187-193. In Russian. Oct. 1991 7 p In RUSSIAN refs
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Experiments were conducted to investigate the effect of the specimen thickness on the mechanical properties and acoustic emission characteristics of AMg2, AMg3, and AMg5 alloys during deformation under conditions of intermittent flow. It is found, in particular, that an increase in the deformation rate lowers the general stress level and reduces the normalized level of the acoustic emission envelope; it also decreases the amount of deformation prior to the onset of intermittent flow, the mean serration amplitude, and the deformation band width, while somewhat increasing the serration frequency. V.L.

A92-31982
EFFECT OF ANNEALING CONDITIONS ON STRUCTURE FORMATION AND CORRELATION BETWEEN THE STRUCTURE AND MECHANICAL PROPERTIES OF ALUMINUM-BERYLLIUM ALLOY FOILS [VLIIANIE REZHIMOV OTZHIGA NA FORMIROVANIE STRUKTURY I EE KORRELIATSIIA S MEKHANICHESKIMI SVOISTVAMI FOL'G IZ ALIUMINII-BERILLIEVOGO SPLAVA]
L. I. KOLESNIK, K. V. OLEINIKOV, P. M. ROMANKO, V. G. TKACHENKO, and IU. V. USOV (AN Ukrainy, Institut Problem Materialovedeniia, Kiev, Ukraine) Problemy Prochnosti (ISSN 0556-171X), no. 1, 1992, p. 28-32. In Russian. 1992 5 p In RUSSIAN refs
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The formation of the structure of foils of an Al-Be alloy (50 percent Be) after annealing was investigated experimentally using X-ray diffraction analysis. By using experimental design techniques, an expression is obtained which relates the mechanical properties of the foils to the anneal temperature and time; the effect of structural parameters on the mechanical properties of the foils is determined. The mechanisms of foil hardening and fracture are investigated. The results of the study provide a way to control the structure and properties of Al-Be foils. V.L.

A92-36530
EFFECT OF NICKEL ALUMINIDE AND MAGNESIUM SILICIDE ON THE STRUCTURE AND MECHANICAL AND CASTING PROPERTIES OF AN AL-ZN-MG-CU ALLOY [VLIIANIE ALIUMINIDA NIKELIA I SILITSIDA MAGNIIA NA STRUKTURU, MEKHANICHESKIE I LITEINYE SVOISTVA SPLAVA AL-ZN-MG-CU]
N. A. BELOV, V. S. ZOLOTOREVSKII, and E. E. TAGIEV Metally (ISSN 0568-5303), no. 1, Jan.-Feb. 1992, p. 146-151. In Russian. Feb. 1992 6 p In RUSSIAN refs
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The phase diagram of the system Al-Zn-Mg-Cu-Ni-Si was investigated in a concentration triangle with apexes at: (1) Al + 6 pct Zn + 1.6 pct Mg + 1 pct cu; (2) Al + 6 pct Zn + 1.6 pct Mg + 1 pct Cu + 8 pct Ni; and (3) Al + 6 pct Zn + 12 pct Mg + 1 pct Cu + 6 pct Si using optical and electron microscopy, electron probe microanalysis, and thermal analysis. In the concentration region investigated, the phase diagram is found to be similar to a quasi-ternary section of the eutectic type with NiAl3 and Mg2S phases. The temperatures and concentrations of binary and ternary eutectic reactions are determined. A mathematical model is developed which relates the mechanical and casting properties of the alloys to their composition. V.L.

A92-40461
MULTICOMPONENT LIQUID-METAL COOLANTS WITH REGULATED PROPERTIES FOR SPACE NUCLEAR REACTOR-GENERATOR OF BIG ORBITAL STATION
D. N. KAGAN (Rossiiskaia Akademiia Nauk, Institut Vysokikh Temperatur, Moscow, Russia) IN: SPS 91 - Power from space; Proceedings of the 2nd International Symposium, Gif-sur-Yvette, France, Aug. 27-30, 1991 1991 5 p refs

A method for experimental investigation of thermodynamic functions of multicomponent liquid-metal systems on the basis of alkali- and alkali-earth metals is presented. Being both low-temperature and high-temperature coolants simultaneously, these systems can be utilized for nuclear and solar installations in space. The enthalpy of formation at all the temperatures and concentrations and the reaction of components at all the concentrations and one temperature (400 K) are measured. R.E.P.

A92-51824
MATERIALS FOR AEROSPACE WELDED STRUCTURES. I - HIGH-STRENGTH LIGHT ALLOYS AND STRUCTURAL MATERIALS
V. S. TASHCHILOV (NPO Composite, Moscow, Russia), A. IA. ISHCHENKO (Ukrainian Academy of Sciences, Institute of Electrical Welding, Kiev, Ukraine), and N. V. SHIGANOV (NPO Composite, Moscow, Russia) IN: Welding in space and the construction of space vehicles by welding; Proceedings of the Conference, New Carrollton, MD, Sept. 24-26, 1991 1991 6 p refs
Copyright

A comprehensive examination is presented on Soviet-period experience with the weldability and space environment service suitability of Mg-, Al-, and Ti-base alloys, as well as the boron fiber-reinforced metal-matrix composites that can be based on them. The record accumulated by Ti-base alloys is an especially discouraging one, in virtue of the effects on welded joints of gas inclusions; oxygen, in particular, drastically reduces ductility. O.C.

A92-51825
MATERIALS FOR AEROSPACE WELDED STRUCTURES. II - STEELS AND HEAT-RESISTANT ALLOYS
V. S. TASHCHILOV (NPO Composite, Moscow, Russia), K. A. IUSHCHENKO (Ukrainian Academy of Sciences, Institute of Electrical Welding, Kiev, Ukraine), and N. V. SHIGANOV (NPO Composite, Moscow, Russia) IN: Welding in space and the construction of space vehicles by welding; Proceedings of the Conference, New Carrollton, MD, Sept. 24-26, 1991 1991 5 p refs
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An account is given of Soviet-period practices and experiences with the orbital environment performance of steels and Ni-base refractory alloys. Attention is given to representative data on their various welded joint types' strength and durability. Recommendations for these various materials' application are made in light of unique susceptibilities discovered in the course of space environment exposure. O.C.

A92-53868
THEORY OF PHASE TRANSFORMATIONS IN METALS [K TEORII FAZOVYKH PREVRASHCHENII V METALLAKH]
S. I. MEDNIKOV and D. M. GUREEV (Rossiiskaia Akademiia Nauk, Fizicheskii Institut, Kuibyshev, Russia) Zhurnal Tekhnicheskoi

Fiziki (ISSN 0044-4642), vol. 61, no. 12, Dec. 1991, p. 53-58. In Russian. Dec. 1991 6 p In RUSSIAN refs
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A microscopic approach to phase transformations in metals is developed. The restructuring of the lattice during phase transformations of the first kind is treated as a transition of a cluster of ions from one phase to another. A method is proposed for determining the cluster parameters from the material properties and thermodynamic characteristics of the phase transformation. Based on a cluster model of lattice restructuring, expressions are obtained for the activation energy for new phase growth. V.L.

A92-53877
STRUCTURE AND PROPERTIES OF ALUMINUM-LITHIUM ALLOY 1430 [STRUKTURA I SVOISTVA ALIUMINIEVO-LITIEVOGO SPLAVA 1430]
F. M. ELKIN, N. A. NARYSHKINA, V. N. ANAN'EV, and A. V. RUDOI Metally (ISSN 0568-5303), no. 3, May-June 1992, p. 120-125. In Russian. Jun. 1992 6 p In RUSSIAN
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The structure and properties of extruded strips of 1430 alloy were investigated as a function of extrusion temperature and the extent of deformation during cold straightening following quenching. The optimal aging conditions (temperature, 125-150 C; duration, 16-64 hr) are determined, and diagrams of mechanical properties and phase transformations are presented. The alloy is shown to be notch-insensitive. A heat treatment schedule is proposed which practically eliminates anisotropy of mechanical properties in 15x220-mm strip. V.L.

A92-54507
FORMATION OF SUBMICROCRYSTALLINE STRUCTURE IN TIAL INTERMETALLIC COMPOUND
R. M. IMAEV, V. M. IMAEV, and G. A. SALISHCHEV (Russian Academy of Sciences, Institute for Metals Superplasticity Problems, Ufa, Russia) Journal of Materials Science (ISSN 0022-2461), vol. 27, no. 16, Aug. 15, 1992, p. 4465-4471. 15 Aug. 1992 7 p refs
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The TiAl intermetallic compound was used to illustrate an approach which enables the creation of a submicrocrystalline structure in massive semifinished products made of hard-to-deform materials by means of their deformation at elevated temperatures. Tensile mechanical properties of the TiAl intermetallic compound with a mean grain size of 0.4 micron were tested. In this state, the lower temperature limit of superplasticity in TiAl was found to be 800 C. At this temperature and at an initial strain rate of 8.3 x 10 exp -4/s, the relative elongation to rupture attains 225 percent. Author

N92-14143# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: MATERIALS SCIENCE
31 Oct. 1991 22 p Transl. into ENGLISH of various Russian articles
(JPRS-UMS-91-008) Avail: CASI HC A03/MF A01

Abstracts of Soviet publications in various areas of material science are presented. The areas covered include: corrosion, testing and analysis, ferrous metals, and nonmetallic materials. K.S.

N92-22318# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: MATERIALS SCIENCE
4 Feb. 1992 59 p Transl. into ENGLISH of various Russian articles
(JPRS-UMS-92-001) Avail: CASI HC A04/MF A01

A bibliography of Central Eurasian materials science research is given. Topics covered include analysis and testing, coatings, composite materials, corrosion, ferrous metals, nonmetallic materials, production engineering, metallurgy, mining, and metal working. Author

N92-31218# Westinghouse Savannah River Co., Aiken, SC.
THERMODYNAMIC EVAPORATION OF HIGHLY VOLATILE COMPONENTS IN THE VACUUM DEGASSING OF MELTED ALUMINUM ALLOYS
G. S. MAKAROV 1992 9 p Transl. into ENGLISH from Teknologiya Legkikh Splavov (USSR), v. 5, 1970 p 31-36
(Contract DE-AC09-89SR-18035)
(DE92-015315; WSRC-TR-146) Avail: CASI HC A02/MF A01

Based on thermodynamic analysis, the vapor tension of the volatile components over double aluminum alloys was determined. Vacuum degassing of aluminum alloys creates conditions for the evaporation of alloyed components or admixtures that have a high power tension. The process for the elimination of these substances is subjected to the same principles as the process for the evacuation of hydrogen. Substantial losses of the highly volatile components are possible in instances when their vapor tension exceeds the sum of the external pressures, preventing the formation of the vapor phase in the melt. DOE

N92-31584# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: MATERIALS SCIENCE
30 Jun. 1992 40 p Transl. into ENGLISH from various Russian articles
(JPRS-UMS-92-010) Avail: CASI HC A03/MF A01

Given here is a bibliography of Central Eurasian materials science. Topics covered include analysis and testing, protective coatings, ferrous and nonferrous metals, alloys, nonmetallic materials, metal working, and mining. Author

N92-33129# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: MATERIALS SCIENCE
28 Jul. 1992 64 p Transl. into ENGLISH from various Russian articles
(JPRS-UMS-92-011) Avail: CASI HC A04/MF A01

Given here is a bibliography of Central Eurasian research in materials science. Topics covered include analysis and testing, coatings, corrosion, ferrous and nonferrous metals, nonmetallic materials, metal working, welding, metallurgy, and mining. Author

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NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

A92-10861
SOME ASPECTS OF THE ELECTRIC STRENGTH OF POLYMERS [NEKOTORYE VOPROSY ELEKTRICHESKOI PROCHNOSTI POLIMEROV]
A. I. SLUTSKER, T. M. VELIEV, I. K. ALIEVA, V. A. ALEKPEROV, and S. A. ABASOV (AN SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR) Pis'ma v Zhurnal Tekhnicheskoi Fiziki (ISSN 0320-0116), vol. 17, July 12, 1991, p. 67-72. In Russian. 12 Jul. 1991 6 p In RUSSIAN refs
Copyright

Experiments were carried out on polyethylene and polyethylene terephthalate films in the micron thickness range to investigate the possibility of increasing the dielectric strength of the polymers through the manipulation of the accumulated charge. It is shown, in particular, that holding polymer specimens in a constant electric field reduces their dielectric strength in an electric field of the same polarity and increases their strength in a field of the opposite polarity. This result is consistent with the conclusion that the breakdown of dielectrics is preceded by the formation of binary space charges (i.e., polarized heterocharges). V.L.

A92-15049
EFFECT OF RADIATION ON THE OPTICAL AND DIELECTRIC PROPERTIES OF PLZT X/65/35 CERAMIC [VLIIANIE OBLUCHENIIA NA OPTICHESKIE I DIELEKTRICHESKIE SVOISTVA KERAMIKI TSTSL X/65/35]
H. WEBER, G. ZH. GRINVALDS, S. S. DINDUN, KH. KLIMA, A. A. KRUMINIA, A. N. RUBULIS, A. A. SPROGIS, U. A. ULMANIS, KH. SHVABL, and A. R. STERNBERG Avtometriia (ISSN 0320-7102), July-Aug. 1991, p. 54-60. In Russian. Aug. 1991 7 p In RUSSIAN refs
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Experimental data are presented on changes in the properties of a lanthanum-modified lead zirconium titanate ceramic, PLZT X/65/35 (where X = 4.5-10.5 at. pct La), under various types of radiation. Particular attention is given to the effect of reactor neutrons on the optical properties of this transparent ferroelectric ceramic. It is shown that all types of radiation produce a characteristic additional maximum in the differential optical absorption spectrum at 380 nm. Radiation defects have a low activation energy and are annealed at 400-500 C. V.L.

A92-18244
EPOXY OLIGOMERS AND ADHESIVE COMPOSITIONS [EPOKSIDNYE OLIGOMERY I KLEEVYE KOMPOZITSII]
IURII S. ZAITSEV, IURII S. KOCHERGIN, MIKHAIL K. PAKTER, and ROMAN V. KUCHER Kiev, Izdatel'stvo Naukova Dumka, 1990, 200 p. In Russian. 1990 200 p In RUSSIAN refs
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The book deals with the classification and physicochemical properties of epoxy oligomers, structural organization of polymers based on epoxy oligomers, and processes associated with the formation of the polymer net and microstructure. Original research data are presented on the structure and properties of high-impact materials based on epoxy polymers and their mixtures with thermoelastoplastics and heat-resistant polyheteroarylenes. Adhesives based on these systems are characterized. V.L.

A92-18275
STRUCTURE AND PROPERTIES OF HOT-PRESSED MATERIALS BASED ON SILICON NITRIDE [STRUKTURA I SVOISTVA GORIACHEPRESSOVANNYKH MATERIALOV NA OSNOVE NITRIDA KREMNIIA]
M. G. ANDREEVA, O. A. BABII, IU. G. GOGOTSI, O. N. GRIGOR'EV, and V. P. IAROSHENKO (AN USSR, Institut Problem Materialovedeniia, Kiev, Ukrainian SSR) Poroshkovaia Metallurgiia (ISSN 0032-4795), Oct. 1991, p. 36-42. In Russian. Oct. 1991 7 p In RUSSIAN refs
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Structure formation in hot-pressed ceramics based on silicon nitride and factors determining their physicomechanical properties were studied experimentally. It is found that the use of Si3N4 powders of different fractional and phase compositions leads to differences in the behavior of the material during hot pressing and significant differences in the phase composition of the materials produced under the same hot-pressing conditions. It is also shown that the strength of the hot-pressed materials is determined to a large degree by the method of the addition of activators and conditions of mixing. V.L.

A92-21582
CONSIDERATION OF LONGITUDINAL-TRANSVERSE BENDING IN MODELING THE PHYSICOMECHANICAL CHARACTERISTICS OF ELASTIC FOAMS WITH AN OPEN POLYHEDRAL STRUCTURE [UCHET PRODOL'NO-POPERECHNOGO IZGIBA PRI MODELIROVANII FIZIKO-MEKHANICHESKIKH KHARAKTERISTIK ELASTICHNYKH PENOPLASTOV OTKRYTOI POLIEDRICHESKOI STRUKTURY]
S. A. MAVRINA and V. A. TELEGINA (Vladimirskii Politekhnicheskii Institut, Vladimir, USSR) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), July-Aug. 1991, p. 697-702. In Russian. Aug. 1991 6 p In RUSSIAN refs
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A92-25278
HEATING OF POLYMER COATINGS BY INFRARED LASER RADIATION [NAGREV POLIMERNYKH POKRYTII INFRAKRASNYM LAZERNYM OBLUCHENIEM]
L. N. NIKITIN, E. E. SAID-GALIEV, and I. G. MERINOV (AN SSSR, Institut Elementoorganicheskikh Soedinenii, Moscow, USSR) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), Sept.-Oct. 1991, p. 783-786. In Russian. Oct. 1991 4 p In RUSSIAN refs
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A model is presented for calculating thermal fields in coatings on substrates with good heat transfer characteristics under infrared laser heating. The excess stationary temperatures on the coating surface are calculated using noncomposite and composite coatings based on poly-2,6-dimethyl-1,4-phenylene oxide as an example. The coating thickness is determined for which the surface temperature reaches 693 K, corresponding to the onset of the thermal degradation of the matrix. The calculated excess temperatures correlate well with experimental data. V.L.

A92-25302
EFFECT OF TECHNOLOGICAL FACTORS ON THE FORMATION OF THE STRUCTURE AND PROPERTIES OF A HOT-PRESSED SILICON NITRIDE CERAMIC [VLIIANIE TEKHNOLOGICHESKIKH FAKTOROV NA FORMIROVANIE STRUKTURY I SVOISTV GORIACHEPRESSOVANNOI NITRIDOKREMNIEVOI KERAMIKI]
V. B. VINOKUROV, V. A. MEL'NIKOVA, L. F. OCHKAS, IU. G. TKACHENKO, and O. A. BABII (AN USSR, Institut Problem Materialovedeniia, Kiev, Ukrainian SSR) Poroshkovaia Metallurgiia (ISSN 0032-4795), Dec. 1991, p. 61-67. In Russian. Dec. 1991 7 p In RUSSIAN refs
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The dispersity and distribution of the matrix phase and the mechanical properties of a hot-pressed beta-Si3N4 ceramic with activating additives of aluminum and titanium oxides are investigated in relation to the milling conditions (steel ball diameter) and chemical and granulometric compositions of the powders. It is found that, during hot pressing, the presence of 4.2-11.5 percent iron powder does not decrease the room-temperature mechanical strength of the material (490 MPa). Contamination with iron is acceptable during the production of structural materials based on beta-Si3N4 ceramic intended for use at room temperature. V.L.

A92-42880
MECHANICAL PROPERTIES EVALUATION OF THIN COATINGS
N. V. NOVIKOV, M. A. VORONKIN, and S. B. DUB (Ukrainian Academy of Sciences, Institute for Superhard Materials, Kiev, Ukraine) IN: New diamond science and technology; Proceedings of the 2nd International Conference, Washington, DC, Sept. 23-27, 1990 1991 5 p
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Knoop and Vickers hardness measurements with indentor loads of 0.1 to 5.0 N were carried out on silicon carbide films up to 6 microns thick deposited on copper and hard alloy substrates and diamondlike carbon coatings produced on molybdenum and silicon substrates. It is found that the properties of the substrate significantly affect the mechanical behavior of the film/substrate system. In the case of hard films on hard substrates, radial cracks are formed which propagate well beyond the contact region. In the case of soft substrates, all cracks are grouped in the contact region. Film penetration into the substrate is also observed for soft substrates under relatively low external forces. V.L.

A92-53870
STRUCTURE AND ELECTROPHYSICAL PROPERTIES OF HOT-PRESSED CERAMIC MATERIALS IN THE SYSTEM SI3N4-SIC. I - STRUCTURE FORMATION AND PHASE COMPOSITION [STRUKTURA I ELEKTROFIZICHESKIE SVOISTVA GORIACHEPRESSOVANNYKH KERAMICHESKIKH MATERIALOV V SISTEME SI3N4-SIC. I - STRUKTUROOBRAZOVANIE I FAZOVYI SOSTAV]

A. A. KAS'IANENKO, V. IA. PETROVSKII, L. A. SHIPILOVA, and S. I. CHUGUNOVA (AN Ukrainy, Institut Problem Materialovedeniia, Kiev, Ukraine) Poroshkovaia Metallurgiia (ISSN 0032-4795), no. 7, July 1992, p. 52-57. In Russian. Jul. 1992 6 p In RUSSIAN refs
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A study is made of the effect of the phase and granulometric composition of the initial materials on the composition and structure of hot-pressed Si3N4-SiC composites. It is found that the use of MgO as a hot-pressing activator makes it possible to obtain composites without any significant changes in the phase composition. The structure of the composite is largely determined by the phase ratio in the initial mixture and powder dispersity. V.L.

A92-53875
VISCOSITY CHARACTERISTICS OF SYNTHETIC AVIATION OILS AT LOW TEMPERATURES [VIAZKOSTNYE KHARAKTERISTIKI SINTETICHESKIKH AVIATSIONNYKH MASEL PRI NIZKIKH TEMPERATURAKH]
A. I. ECHIN, V. N. BAKUNIN, and T. N. TARANNIKOVA (Gosudarstvennyi NII Khimicheskoi Promyshlennosti, Russia) Khimiia i Tekhnologiia Topliv i Masel (ISSN 0023-1169), no. 6, 1992, p. 23-25. In Russian. 1992 3 p In RUSSIAN refs
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The viscosity characteristics of synthetic aviation motor oils are examined in relation to their cold start and high-temperature operation performance. An exponential relationship is established between the kinematic and dynamic viscosities of low-viscosity synthetic oils, and conversion coefficients are determined. Under operation near the limiting state, oxidized low-viscosity synthetic oils retain the properties of Newtonian fluids. V.L.

A92-54861
WELDABILITY OF POLYMERIC MATERIALS HETEROGENEOUS AS TO CHEMICAL NATURE FROM THE STANDPOINT OF MORPHOLOGY
L. I. BEZRUK, G. B. ESAULENKO, V. IU. KONDRATENKO, and G. N. KORAB (AN Ukrainy, Institut Elektrosvarki, Kiev, Ukraine) IN: Advances in joining newer structural materials; Proceedings of the International Conference, Montreal, Canada, July 23-25, 1990 1990 6 p
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Consideration is given to the morphological characteristics of welding joints in polymeric materials emphasizing the formation of welds in materials with dissimilar chemical compositions. The physicochemical process at the component interface is shown to be equivalent to that of initial fabrication of the polymeric composites. C.C.S.

N92-10492# Odessa State Univ. (USSR). Dept. of Experimental Physics.
THE FIELD DRIFT OF IONS AND ITS INFLUENCE ON THE ELECTRICAL PROPERTIES OF SNO2 Abstract Only
A. V. IGNATOV (Odessa State Univ. (USSR).), A. V. BURLAK (Odessa State Univ. (USSR).), V. V. SERDYUK (Odessa State Univ. (USSR).), V. LANTTO (Oulu Univ. (Finland).), and S. LEPPAVUORI (Oulu Univ., Finland) *In* Oulu Univ., Proceedings of the 25th Annual Conference of the Finnish Physical Society 1 p 1991
Avail: CASI HC A01/MF A03

The effect of high electric fields at elevated temperatures on some electrical properties of ceramic SnO2 thick film samples was studied by measuring both the I-V characteristics and the potential distribution along the field direction for samples annealed in the presence of high electric fields at temperatures between 300 and 400 C. It was found that annealing of the samples in electric fields of 100 to 3000 V/cm changed both the room temperature I-V characteristics and the potential distribution of the samples dramatically. A very high asymmetry, for instance, was found between the potential distribution of the forward and reverse bias (under annealing) directions. This means that some field drift of ions (or defects) appeared in SnO2 at elevated temperatures between 300 and 400 C in the presence of high electric fields. ESA

N92-70699 Academy of Sciences of the Ukrainian SSR, Kiev. Inst. of Physics.
POLYMETHINE DYES FOR A PASSIVE Q-SWITCH [POLIMETINOVYE KRASITELI DLIA PASSIVNOI MODULIATSII DOBROTNOSTI]
M. V. MELISHCHUK, V. I. PROKHORENKO, G. G. DIADIUSKA, N. P. VASILENKO, and IU. L. SLOMINSKII 1986 61 p In RUSSIAN
(PREPRINT-13) Avail: CASI HC A04

The spectral, kinetic, nonlinear optical, and modulational characteristics of 26 polymethine dyes, with absorbency in the 400 - 1060 nm range, are discussed. The dyes have uses as discriminating filters and passive Q-switches. Transl. by L.S.H.

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PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels.

A92-27524
MODEL OF THE UNSTEADY COMBUSTION OF A LAYERED SYSTEM [MODEL' NESTATSIONARNOGO GORENIIA SLOEVOI SISTEMY]
L. K. GUSACHENKO and I. F. SADYKOV Fizika Goreniia i Vzryva (ISSN 0430-6228), vol. 27, Sept.-Oct. 1991, p. 81-84. In Russian. Oct. 1991 4 p In RUSSIAN refs
Copyright

The characteristic times of the transient process are estimated for a system consisting of oxidizer and propellant layers that are incapable of burning individually and can react in the gas phase only. A simple expression for the unsteady gas formation rate is obtained in a frequency region with an upper bound. The analysis presented here is based on a phenomenological approach. V.L.

A92-43457
THERMOPHYSICS OF STABLE COMBUSTION WAVES OF SOLID PROPELLANTS
A. A. ZENIN (Russian Academy of Sciences, Institute of Chemical Physics, Moscow, Russia) IN: Nonsteady burning and combustion stability of solid propellants 1992 35 p refs
Copyright

Quantitative descriptions are given of thermal processes that occur in steadily propagating combustion waves from solid propellants emphasizing the zones that affect combustion-wave rates. Thermocouple experiments are reviewed in terms of temperature profiles and surface temperatures, and other methods give data on radiant fluxes towards the surface and the structure of the burning surface. Propellant combustion is considered to be monodimensional and quasisteady, and volumetric heat-release rates are given for various pressures and thermal parameters. Reaction zones are shown to have small widths at the surface layer of the solid phase, and a wide reaction zone at the gas phase. The results of the experiments described are shown to be valuable for the quantitative description of diverse nonstationary phenomena and for modeling propellant combustion. C.C.S.

A92-43466
THEORY OF NONSTEADY BURNING AND COMBUSTION STABILITY OF SOLID PROPELLANTS BY THE ZELDOVICH-NOVOZHILOV METHOD
B. V. NOVOZHILOV (Russian Academy of Sciences, Institute of Chemical Physics, Moscow, Russia) IN: Nonsteady burning and combustion stability of solid propellants 1992 41 p refs
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The phenomenological approach to the study of nonsteady burning of solid propellants developed by Zeldovich and Novozhilov is described. The theory focuses on the thermal relaxation time which is the only value of time scale that determines the nonsteady processes in a propellant. The properties of regions whose inertia are not taken into account in previous treatments are included in the steady-state approximation. C.C.S.

A92-45451
AEROSPACE PLANE HYDROGEN SCRAMJET BOOSTING
A. S. RUDAKOV, V. V. KRIUCHENKO, and A. I. LANSHIN (Tsentral'nyi NII Aviatsionnogo Motorostroeniia, Moscow, Russia) IN: International Pacific Air and Space Technology Conference and Aircraft Symposium, 29th, Gifu, Japan, Oct. 7-11, 1991, Proceedings 1991 9 p refs
(SAE PAPER 912071) Copyright

Results are presented of computational investigations carried out to clarify the possibilities of hydrogen scramjet thrust uprating in hypersonic flight (M greater than 8) by adding to the fuel substances with higher density. Thrust, specific impulse, and density impulse are calculated while adding nitrogen, oxygen, water, or inert liquated gases. Fuel is injected tangetially to air flow into combustion chamber with high velocity through gas generator nozzles. For scramjet boosting in hypersonic flight it is suggested to add oxygen to stoichiometric part of hydrogen instead of excessive part of hydrogen. Author

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MATERIALS PROCESSING

Includes space-based development of products and processes for commercial applications.

A92-12864
USE OF FINITE ELEMENT METHOD FOR MODELING OF TEMPERATURE FIELD PROBLEM IN MULTILAYER SEMICONDUCTOR STRUCTURES, PRODUCED AND USED UNDER MICROGRAVITATION CONDITION
A. A. MEL'NIKOV, N. A. KULCHITSKII, and V. T. KHRIAPOV (NPO Orion, Moscow, USSR) IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 3 p refs
Copyright

Mathematical modeling of a thermal field in a multilayer semiconductor structure (MSS) based on the finite element technique is presented. It is concluded that numerical methods make it possible to define the expediency of a device fabrication technology on the basis of MSS and to improve the quality and reliability of microphotoelectronic devices. O.G.

A92-12867
CRYSTAL GROWTH FROM THE VAPOUR-GAS PHASE IN MICROGRAVITY CONDITIONS
M. B. SHCHERBINA-SAMOILOVA (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR) IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 5 p refs
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Experiments on crystal growth from the vapor-gas phase in microgravity are described, and advantages and disadvantages of this method are discussed. Particular attention is given to results of ground-based experiments conducted in the Kristallizator-CSK-1 facility, which include crystal growth of ZnSe and Fe2O3 crystal growth using O-16 and O-18 isotopes. O.G.

A92-12869
GASB CRYSTAL GROWTH IN MICROGRAVITY CONDITIONS
O. V. SHUMAEV and L. L. REGEL' (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR) IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 5 p refs
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An experiment on GaSb crystallization through the Bridgman technique on board the Mir space station is described. The most stable phase of the melt was found to cause the shoulder formation at the beginning of growth. The specific balanced melt shape also affected heat transfer processes in the ampoule, thus leading to a more curvated initial solid-liquid interface and defects in the space crystal. It is concluded that microgravity conditions caused deterioration of the crystal structure. O.G.

A92-12870
EXPERIMENTS ON DIRECTIONAL CRYSTALLIZATION OF INDIUM ANTIMONIDE ON 'FOTON' AUTOMATIC SATELLITES
V. S. ZEMSKOV, M. R. RAUKHMAN, E. A. KOZITSYNA (AN SSSR, Institut Metallurgii, Moscow, USSR), I. V. BARMIN, and A. S. SENCHENKOV (Glavkosmos SSSR, Moscow, USSR) IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 6 p refs
Copyright

The effects of microgravity on growth, morphology, microstructure, and segregation behavior in tellurium doped indium antimonide single crystals have been investigated. Experiments conducted through Bridgman and float zone techniques in evacuated ampoules in Splav and Zone type furnaces on automatic satellites are presented.It is concluded that the Bridgman technique is appropriate for use in those cases when there is no contact with the ampoule walls over a narrow layer around the growth interface. The float-zone technique is most advantageous for growing extremely pure single crystals by repeated zone refining with no contact between the melt and ampoule walls over the whole ingot length. O.G.

A92-12871
SOLIDIFICATION OF GLASSY ALLOY TE80SI20 UNDER ZERO-GRAVITY ('ALCUTEST-2' PROGRAM)
L. L. REGEL', A. M. TURCHANINOV (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR), R. V. PARFEN'EV, I. I. FARBSHTEIN, N. K. SHUL'GA, S. V. IAKIMOV, B. T. MELEKH, S. B. VAKHRUSHEV, and S. V. NIKITIN (AN SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR) IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 4 p refs
Copyright

Physical, mechanical, and electrical properties of the vitreous semiconductor alloy Te80Si20 obtained under microgravity and normal gravity conditions have been studied. Data obtained indicate that the number of defects in the glass solidified under microgravity conditions is less than in its ground analogue. The microgravity prevents from cluster formation. Provided that the defects in the glass are connected with the presence of microclusters formed under solidification the gravitation promotes developing clusters, whereas in the absence of gravitation the glass forming process tends to be ideal. O.G.

A92-12872
SYNTHESIS AND CRYSTALLIZATION OF REFRACTORY COMPOUNDS FROM SOLUTIONS IN METALLIC MELTS UNDER MICROGRAVITATION CONDITIONS
V. N. GURIN, L. I. DEKARTCHENKO, and S. P. NIKANOROV (AN SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR) IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 4 p refs
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Synthesis and crystallization of chromium disilicide from solution in a zinc melt are considered. Microgravity is found to lead to predominant formation and a 1.5-2 times increase in sizes of isometric crystals of this compound, the appearance of new face forms of their growths, and a substantial change in the composition of the crystals obtained. O.G.

A92-12877
CALCIUM SULPHATE AND PHOSPHATE CRYSTALLIZATION UNDER MICROGRAVITY (PALMIRA EXPERIMENT)
L. L. REGEL', A. A. VEDERNIKOV (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR), I. V. MELIKHOV, and V. F. KOMAROV (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 6 p refs
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Results of a space experiment on mass crystallization of gypsum CaSO42H2O and hydroxyapatite Ca5(PO4)3OH from aqueous solutions are presented. The experiment was aimed at studing the influence of microgravity on the crystallization of systems of medium and high degrees of dispersion. It was found that in both cases the changes are due to the spatial organization of the sediment. They consist in aggregation stimulation, a higher probability of orientated aggregation, and, consequently, the formation of elongated disperse textures. Controlled microgravity conditions can be used to obtain disperse crystalline textures.
Author

A92-12878
LUMINESCENCE SPECTRA OF RBAG4I5 SINGLE CRYSTALS GROWN UNDER MICROGRAVITY CONDITIONS
I. KH. AKOPIAN, T. A. VOROB'EVA, S. A. KIRASHOVA, B. V. NOVIKOV (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR), L. L. REGEL', and N. A. BATURIN (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR) IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 4 p refs
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A comparative analysis of the optical properties (photoluminescence and reflections spectra) of RbAg4I5 crystals grown under microgravity and earth conditions has been performed. The samples were prepared using two methods of low-temperature crystallization from the melt of AgI and RbI: cooling an immobile ampoule containing the material (space-cooling S-C and earth-cooling E-C samples) and by an ampoule moving through the temperature field with a given gradient (space-moving S-M and earth moving E-M samples). Preliminary results indicate that the presence of the excitonic structure in the low-temperature photoluminescence spectra of cooling crystals suggests a better quality of these crystals as compared to the moving samples. The AgI content in the ground-based samples is lower but they are more sensitive to radiation. The S-M sample possesses the maximum stability to UV irradiation and has the smallest width of reflection structure at 77 K. O.G.

A92-12886
NUMERICAL AND EXPERIMENTAL INVESTIGATION OF INCREASED CONCENTRATION SAMPLE SEPARATION BY CONTINUOUS FLOW ELECTROPHORESIS IN SPACE
A. A. AKSENOV, A. V. GOLOVINKIN, M. A. MESHKOV (Moskovskii Fiziko-Tekhnicheskii Institut, Dolgoprudny, USSR), A. V. GUDZOVSKII (Academy of Sciences, Institute for the Computer Aided Design, Moscow, USSR), and A. A. SEREBROV (NPO Energiia, Kaliningrad, USSR) IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 5 p refs
Copyright
A mathematical model is proposed which can be used to explain sample suspension properties following separation by continuous-flow electrophoresis (CFE) in space. Expressions for the sample are based on the electrohydrodynamic interactions of particles suspended in a buffer which depend on the value for the respective concentration. The concentration spreading in the CFE chamber is examined for a negligible ponderomotive force. The results are compared to the sample-jet instability in an electric field which occurs in some orbiting and ground-based CFE chambers by using the Mir orbital station as an example. The concentrational effects in Mir electrophoretic experiments can be explained by the dependence of sample suspension properties on the concentrations of fractions. The difference between the conductivity and capacitivity in the sample jet and the pure buffer causes sample-jet instability in the electric field. C.C.S.

A92-12895
STUDY OF POLYACRYLAMIDE GELS SYNTHESIZED DURING MICROGRAVITATION
V. B. LEONT'EV, SH. D. ABDURAKHMANOV, and M. G. LEVKOVICH (AN USSR, Institut Bioorganicheskoi Khimii, Tashkent, Uzbek SSR) IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 5 p refs
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The fabrication of the gels is examined to compare the results on earth with those corresponding to microgravitational conditions. Four characteristics of gravitational sensitivity are proposed and related to the spatial structure formations of 3D polyacrylamide gels. The reactions that occur during the formation of the 3D gels are shown graphically as recorded by the shadow method. The results are compared to control gels, and a distinct sensitivity to gravitation is noted in polyacrylamide gels on both macroscopic and microscopic levels. In the case of microgravity the chemical reactions are separated which modifies the formation process of the 3D gels. Gels can be synthesized with particular properties by taking advantage of the effect of gravitation, and this possibility is demonstrated for the case of zol-gel. C.C.S.

A92-12900
EQUIPMENT FOR THE EXPERIMENTS ON MATERIAL SCIENCES AND THE TECHNOLOGICAL POSSIBILITIES OF SOVIET UNMANNED SPACECRAFT
L. L. REGEL', V. P. SHALIMOV, A. M. TURCHANINOV, A. A. VEDERNIKOV, M. B. SHCHERBINA-SAMOILOVA (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR), G. P. ANSHAKOV, and V. D. KOZLOV (Konstruktorskoe Biuro Foton, USSR) IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 7 p
Copyright
The development of scientific equipment is reviewed emphasizing the study of space materials aboard automated spacecraft with the possibility of payload retrieval. The projects considered are based on the design and fabrication of universal multiobjective furnaces including the ChSK-3 automatic crystal processor, the ABC furnace for large specimens, and the RGA system for studying crystal growth in solutions. The ChSK-3 is a furnace which operates at 1200 C and can process glass and composite specimens, semiconductor materials, and metal and other alloys. The ABC can be operated at up to 1500 C and has several independently controlled heaters; a cooling system is included in the system to permit a stable temperature gradient. Three unmanned spacecraft - the 'Photon', 'Resurs-F', and the 'Nika-T' - are described in detail with respect to supporting potential experiments in materials sciences. C.C.S.

A92-12901
SADKO PROJECT - NEW POSSIBILITIES FOR FUNDAMENTAL RESEARCH IN MATERIALS SCIENCE AND PHYSICS OF FLUIDS UNDER MICROGRAVITY
V. M. BALEBANOV, L. L. REGEL', V. P. SHALIMOV, A. M. TURCHANINOV, A. A. VEDERNIKOV, M. B. SHCHERBINA-SAMOILOVA (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR), V. M. KOVTUNENKO, R. S. KREMNEV, N. A. MOROZOV, B. D. IAKOVLEV (NPO Lavochkin, Moscow, USSR) et al. IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 7 p
Copyright
The development of an unmanned cargo platform for use with the Phobos spacecraft is reviewed with attention given to scientific instrumentation for studying materials and fluids under microgravity conditions. The technological hardware presented includes: (1) a multipurpose universal resistive furnace for specimen processing called the ChSK-3; (2) a second furnace with higher temperature

and processing capabilities called the ABC; and (3) the RGA system for studying crystal growth in solutions with precision recording systems. The Sadko spacecraft is described and found to be capable of supporting the scientific instrumentation when built according to the specifications presented. Sadko is a revised version of the Mars-94 project with a Vega spacecraft lander which can support the technologies for fundamental research on materials and fluid physics. C.C.S.

A92-12902
AUTOMATIC EQUIPMENT FOR SEMICONDUCTOR PRODUCTION IN SPACE
IURII N. D'IAKOV, EVGENII V. MARKOV, ANATOLII I. LOOBUSHKIN, and SERGEI N. SULYGIN (NPO Nauchnyi Tsentr, Moscow, USSR) IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 6 p
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The equipment installed in the long-term orbit station (LOS) Mir is presented and described in terms of both construction and the ability to automatically fabricate semiconductrs in microgravitational conditions. The descriptions include two resistive automatic multifunctional furnaces (the Gallar and the Crator-B furnaces), the Onix control-system architecture and software structure, and an experimental light heater called Optizone-1. The Gallar furnace is designed to conduct a number of experiments and generate industrial semiconductor prototypes. The Onix control system permits the use of a multifunctional reconfigurable algorithm designed for use in the field of materials science. Crator-B is similar to Gallar except that it facilitates oriented solidification, and Optizone-1 provides a LOS environment for microgravitational crystal growth. C.C.S.

A92-13766
EXPERIMENTS IN THE DIRECTIONAL GROWTH OF INDIUM ANTIMONIDE CRYSTALS IN VIALS ON BOARD THE COSMOS-1744 AND FOTON SATELLITES [EKSPERIMENTY PO NAPRAVLENNOI KRISTALLIZATSII V AMPULAKH ANTIMONIDA INDIIA NA ISKUSSTVENNYKH SPUTNIKAKH 'KOSMOS-1744' I 'FOTON']
V. S. ZEMSKOV, M. R. RAUKHMAN, E. A. KOZITSYNA, and I. M. ARSENT'EV Fizika i Khimiia Obrabotki Materialov (ISSN 0015-3214), Sept.-Oct. 1991, p. 46-52. In Russian. Oct. 1991 7 p In RUSSIAN refs
Copyright

Results of satellite-based experimental studies of the directional growth of tellurium-doped indium antimonide crystals are reported. In particular, the morphology, macrostructure, and microstructure of the crystals are examined. The possibility of extending the unsupported growth zone by increasing the free volume in the hot section of the vial is demonstrated. It is shown that crystals grown in zero gravity are free from the layered impurity microinhomogeneity. V.L.

A92-14017
SPECIFIC FEATURES OF CRYSTALLIZATION OF IN-DOPED GERMANIUM UNDER MICROGRAVITY
L. M. SOROKIN (AN SSSR, Fiziko-Tekhnicheskii Institut, St. Petersburg, USSR), A. O. CALZADILLA, G. N. MOSINA, V. V. RATNIKOV, A. S. TREGUBOVA, J. FUENTES, I. L. SHUL'PINA, and M. P. SHCHEGLOV Microgravity Science and Technology (ISSN 0938-0108), vol. 4, Oct. 1991, p. 172-178. Oct. 1991 7 p refs
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An In-doped germanium crystal grown aboard spacecraft by directional crystallization from the melt and also the reference crystal grown on earth under identical time and temperature conditions have been studied by diffraction, metallographic, and electrophysical techniques. The space-grown crystal appears to have a more perfect structure than the reference sample, though it contains a gas pore. The local contact of the melt with the ampoule walls occurred under a pressure as a result of the pore volume compensation and it affected the indium distribution in the considerable part of the crystal. The concentration of the electrically active In in it is below the expected one. The results are discussed on the basis of the dominating dopant segregation mechanism and the crystal microstructure analysis. Author

A92-20464
STABILITY LIMITS OF MINIMUM VOLUME AND BREAKING OF AXISYMMETRIC LIQUID BRIDGES BETWEEN UNEQUAL DISKS
N. A. BEZDENEZHNYKH (AN SSSR, Institut Mekhaniki Sploshnykh Sred, Perm, USSR) and J. MESEGUER (Escuela Tecnica Superior de Ingenieros Aeronauticos, Madrid, Spain) Microgravity Science and Technology (ISSN 0938-0108), vol. 4, Dec. 1991, p. 235-239. Research sponsored by CICYT. Dec. 1991 5 p refs
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This paper deals with the stability limits of minimum volume and the breaking of axisymmetric liquid columns held by capillary forces between two concentric, circular solid disk of different radii. The problem has been analyzed both theoretically and experimentally. A theoretical analysis concerning the breaking of liquid bridges has been performed by using a one-dimensional slice model already used in liquid bridge problems. Experiments have been carried out by using millimetric liquid bridges, and minimum volume stability limits as well as the volumes of the drops resulting after breaking have been measured for a large number of liquid bridge configurations; experimental results being in agreement with theoretical predictions. Author

A92-27001#
LIQUID PHASE EPITAXY - MODELLING AND SPACE EXPERIMENTS
V. I. POLEZHAEV and N. A. VEREZUB (AN SSSR, Institut Problem Mekhaniki, Moscow, USSR) AIAA, Aerospace Sciences Meeting and Exhibit, 30th, Reno, NV, Jan. 6-9, 1992. 10 p. Jan. 1992 10 p refs
(AIAA PAPER 92-0601) Copyright

The gravitational sensitivity for the geometrical uniformity of A3B5 semiconductor epitaxial layers is described for cases of microgravity (the Splav furnace on Salyut and Cosmos space stations), terrestrial environment, and mathematical modelling. The epilayer growth was carried out in a graphite container of the furnace high-temperature isothermal zone for the GaAs and GaP systems. A mathematical model for the layer growth from the saturated solution in the melt was developed using the unsteady Navier-Stokes equations. Results of space experiments and calculations show that there is possibility to eliminate liquid phase epitaxy (LPE) nonuniformities. A slow rotation of the LPE cell which realizes a special type of convection is proposed as one of alternatives to microgravity for controlling the geometrical nonuniformity of epilayers. O.G.

A92-33832
MATERIAL PROCESSING IN HIGH GRAVITY; PROCEEDINGS OF THE 1ST INTERNATIONAL WORKSHOP, DUBNA, RUSSIA, MAY 20-25, 1991
L. L. REGEL', ED. (Russian Academy of Sciences, Space Research Institute, Moscow, Russia), M. RODOT, ED. (CNRS, Laboratoire de Physique des Solides, Meudon, France), and W. R. WILCOX, ED. (Clarkson University, Potsdam, NY) Workshop sponsored by Russian Academy of Sciences, European Materials Research Society, NSF, et al. Journal of Crystal Growth (ISSN 0022-0248), vol. 119, no. 1-2, April 1992, 185 p. For individual items see A92-33833 to A92-33850. Apr. 1992 185 p
Copyright

The papers presented in this volume provide an overview of recent experimental and theoretical research related to crystal growth in high gravity. Topics discussed include crystal growth and material processing above 1000 g; transport modes during crystal growth in a centrifuge; GaSb directional solidification under high gravity conditions; and growth of lead-tin telluride crystals under high gravity. Papers are also presented on the directional solidification of InSn in a centrifuge; laminar convection in the melt during crystal growth in a centrifuge; and gravitational influence on eutectic solidification. V.L.

A92-33837
THE PECULIARITIES OF MATERIAL CRYSTALLIZATION EXPERIMENTS IN THE CF-18 CENTRIFUGE UNDER HIGH GRAVITY
B. V. BURDIN (Gagarin Cosmonaut Training Center, Moscow, Russia), L. L. REGEL', A. M. TURCHANINOV, and O. V. SHUMAEV (Russian Academy of Sciences, Space Research Institute, Moscow, Russia) (Material processing in high gravity; Proceedings of the 1st International Workshop, Dubna, Russia, May 20-25, 1991. A92-33832 13-29) Journal of Crystal Growth (ISSN 0022-0248), vol. 119, no. 1-2, April 1992, p. 61-65. Apr. 1992 5 p refs
Copyright
This paper presents data on the crystallization of various materials using the CF-18 centrifuge at the Gagarin Cosmonaut Center. The geometry and equipment are described. Consideration is given to some peculiarities of preparing and conducting crystal growth experiments in this centrifuge. Vibration in a coordinate system fixed to the crystal growth equipment and the reasons for its initiation are shown. From the results of experiments conducted during the last 10 years, it was concluded that there are many possibilities of using various classes of model materials to study crystal growth processes under high gravity conditions. Author

A92-33839
GASB DIRECTIONAL SOLIDIFICATION UNDER HIGH GRAVITY CONDITIONS
L. L. REGEL' and O. V. SHUMAEV (Russian Academy of Sciences, Space Research Institute, Moscow, Russia) (Material processing in high gravity; Proceedings of the 1st International Workshop, Dubna, Russia, May 20-25, 1991. A92-33832 13-29) Journal of Crystal Growth (ISSN 0022-0248), vol. 119, no. 1-2, April 1992, p. 70-73. Apr. 1992 4 p refs
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Some results of GaSb crystal growth by the Bridgman technique using a seed in the C-18 centrifuge are presented. The crystals grown at a centrifuge acceleration of 5.2 g were analyzed by standard metallography, scanning electron microscopy (SEM) and X-ray topography. During crystal growth in a centrifuge, the interface curvature was smaller than with terrestrial and microgravity experiments. Striations in the seed were absent in the remelted crystal. Twins were found only in the last material to grow. Other features of the grown ingots are presented as well. Author

A92-33842
GROWTH OF LEAD-TIN TELLURIDE CRYSTALS UNDER HIGH GRAVITY
L. L. REGEL', A. M. TURCHANINOV, O. V. SHUMAEV (Russian Academy of Sciences, Space Research Institute, Moscow, Russia), I. N. BANDEIRA, C. Y. AN, and P. H. O. RAPPL (Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil) (Material processing in high gravity; Proceedings of the 1st International Workshop, Dubna, Russia, May 20-25, 1991. A92-33832 13-29) Journal of Crystal Growth (ISSN 0022-0248), vol. 119, no. 1-2, April 1992, p. 94-97. Apr. 1992 4 p refs
Copyright
The influence of high gravity environment on several growth habits of lead-tin telluride crystals is investigated. Preliminary experiments with Pb(0.8)Sn(0.2)te grown by the Bridgman technique have been conducted at the centrifuge facilities of the Y.A. Gagarin Cosmonauts Center in the USSR, using accelerations of 5, 5.2 and 8 g. The Sn distribution for these crystals is compared with that obtained for growth at normal gravity, and the results show the existence of significant compositional inhomogeneities along the axial direction. Convection currents at high gravity seem to help multiple nucleation and subsequent random orientation of growth. Analyses of carrier concentrations as well as morphological characteristics are also made. Author

A92-33844
LAMINAR CONVECTION IN THE MELT DURING GROWTH IN A CENTRIFUGE
P. A. VOROB'EV, N. A. BATURIN, and O. V. SHUMAEV (Russian Academy of Sciences, Space Research Institute, Moscow, Russia) (Material processing in high gravity; Proceedings of the 1st International Workshop, Dubna, Russia, May 20-25, 1991. A92-33832 13-29) Journal of Crystal Growth (ISSN 0022-0248), vol. 119, no. 1-2, April 1992, p. 111-121. Apr. 1992 11 p refs
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Laminar convection flows in the melt during Bridgman crystal growth in a cylindrical ampoule in a centrifuge are described analytically. Expressions are obtained for the axial and radial velocity components in the ampoule volume and near the interface. It is shown that the Coriolis force significantly affects the convection flows in the melt. In particular, at low flow velocities, the Coriolis force leads to a decrease in the total convection power and a more homogeneous profile of velocity distribution within the ampoule. At high flow velocities, the Coriolis force leads to a restructuring of the convective flow, which becomes antisymmetrical. V.L.

A92-33845
PROPERTIES OF SUPERCONDUCTING BI-SR-CA-CU-O SYSTEM REMELTED UNDER HIGHER GRAVITY CONDITIONS
M. P. VOLKOV, B. T. MELEKH, R. V. PARFEN'EV, N. F. KARTENKO (Russian Academy of Sciences, Physical-Technical Institute, St. Petersburg, Russia), L. L. REGEL', and A. M. TURCHANINOV (Russian Academy of Sciences, Space Research Institute, Moscow, Russia) (Material processing in high gravity; Proceedings of the 1st International Workshop, Dubna, Russia, May 20-25, 1991. A92-33832 13-29) Journal of Crystal Growth (ISSN 0022-0248), vol. 119, no. 1-2, April 1992, p. 122-125. Apr. 1992 4 p refs
Copyright
The structure and magnetic properties of high Tc superconductor Bi-Sr-Ca-Cu-O samples remelted under 1, 8, and 12 g0 gravity levels have been investigated. Superconducting properties change along the ingots. The dependence of structural and superconducting properties on the gravity level and their time degradation are observed. Author

A92-33850
THE PHENOMENA OF CRYSTALLIZATION IN CENTRIFUGAL FORCE FIELDS AND THE DYNAMO EFFECT
SH. MAVLONOV (Tajik Academy of Sciences, Physico-Technical Institute, Dushanbe, Tajikistan) (Material processing in high gravity; Proceedings of the 1st International Workshop, Dubna, Russia, May 20-25, 1991. A92-33832 13-29) Journal of Crystal Growth (ISSN 0022-0248), vol. 119, no. 1-2, April 1992, p. 167-175. Apr. 1992 9 p refs
Copyright
The conditions of directional solidification in centrifugal force fields and morphological features of the resulting single crystals are examined with reference to experimental results obtained for high-purity (99.9999 percent) aluminum single crystals solidified at accelerations up to 1000 g. An analysis of the morphological features of the single crystals from the standpoint of the effect of convection, Coriolis force, and vortex pair formation suggests that the liquid rotates around its axis in the form of a toroid, i.e., a dynamo effect is present. V.L.

A92-46510
MODIFICATION OF THE SURFACE OF A SOLID BODY IN AN ELECTRIC FIELD [O MODIFIKATSII POVERKHNOSTI TVERDOGO TELA V ELEKTRICHESKOM POLE]
I. N. ALIEV and P. P. POLUEKTOV Pis'ma v Zhurnal Tekhnicheskoi Fiziki (ISSN 0320-0116), vol. 18, no. 7, April 12, 1992, p. 7, 8. In Russian. 12 Apr. 1992 2 p In RUSSIAN
Copyright
The modification of a solid surface in an electric field is examined theoretically with reference to materials processing in space. It is noted that, if the surface has electric charges, the surface atoms are subject to the effect of an electric field; in the general case, owing to finite electroconductivity the charges are distributed in such a way that the field inside the material is nullified. A formula is presented which shows that all the impurities that

have a polarizability greater than the polarizability of matrix atoms are accumulated on the surface. The accumulation kinetics is controlled by diffusion, which prescribes the characteristic time of the process. L.M.

N92-13085# Joint Publications Research Service, Arlington, VA.
ALTERNATIVE PROPOSAL FOR SPACE PRODUCTION, POLYUS MODULE LAUNCH REVEALED
DMITRIY ALEKSEYEVICH POLUKHIN *In its* JPRS Report: Science and Technology. USSR: Space p 39-40 30 Jul. 1990 Transl. into ENGLISH from Pravda, Moscow (USSR), 17 May 1990 p 3
Avail: CASI HC A02/MF A01

In general terms a proposal to build a space factory from several space modules is discussed. The program would be for the manufacture of semiconductors, optical glasses, biological preparations, and pharmaceuticals. Author

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ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

A92-30239
EFFECT OF SHOCK COMPRESSIBILITY ON THE HIGH-VELOCITY COLLISION BETWEEN A RIGID BODY AND A POROUS MEDIUM [VLIIANIE UDARNOI SZHIMAEMOSTI NA PROTSESS VYSOKOSKOROSTNOGO SOUDARENIIA TVERDOGO TELA S PORISTOI SREDOI]
A. A. KOZHUSHKO, V. P. MAIBORODA (AN SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR), and N. A. ZLATIN Zhurnal Tekhnicheskoi Fiziki (ISSN 0044-4642), vol. 61, June 1991, p. 197-201. In Russian. Jun. 1991 5 p In RUSSIAN refs
Copyright

The high-velocity collision between a rigid body and a porous medium is examined in the context of a hydrodynamic model, with particular attention given to the effect of shock compressibility. It is shown that, at supersonic velocities, the resistance of a porous obstacle with a porosity of 30 percent is close to that of a dense solid obstacle of the same composition. This finding is relevant to the determination of the depth of the crater formed in a porous material in the case of high-velocity impact. Experimental results are presented for the high-velocity (3 km/s) penetration of solid copper indenters into porous copper targets with porosities of 8, 15, 24, 35, and 45 percent. V.L.

A92-36606
AIRFIELD CONSTRUCTION (3RD REVISED AND ENLARGED EDITION) [STROITEL'STVO AERODROMOV /3RD REVISED AND ENLARGED EDITION/]
LEONID I. GORETSKII, ADOL'F M. BOGUSLAVSKII, VADIM A. SEREBRENIKOV, V. I. BARZDO, T. P. LESHCHITSKAIA, and S. M. POLOSIN-NIKITIN Moscow, Izdatel'stvo Transport, 1991, 368 p. In Russian. 1991 368 p In RUSSIAN refs
(ISBN 5-277-01070-X) Copyright

The principal engineering aspects of airfield construction are discussed. In particular, attention is given to the fundamental principles and organizational aspects of airfield construction; excavation work and airfield layout; construction of drainage systems; foundations and pavements; and quality control and safety engineering. The discussion also covers the operation of various support plants, including concrete production and mixing, production of asphalt-concrete mixtures and organic binders, production of structural steel and reinforced concrete components, and operation of stone quarries and gravel pits. V.L.

A92-50816
PRINCIPLES OF RADIATION SAFETY FOR REACTOR SPACE NUCLEAR POWER SOURCES AND METHODS OF THEIR REALIZATION
AL'BERT A. GAFAROV, BORIS I. BAKHTIN, and ALEKSEI V. KOSOV (Scientific-Research Institute of Thermal Processes, Moscow, Russia) IN: IECEC '91; Proceedings of the 26th Intersociety Energy Conversion Engineering Conference, Boston, MA, Aug. 4-9, 1991. Vol. 6 1991 6 p refs
Copyright

The radiation safety (RS) principles, which are used in reactor space nuclear power sources (SNPSs) development in the USSR are stated. The main results of theoretical and experimental studies of the methods of RS principles realization are represented. It is shown how the results of these studies are used in the development of RS systems for SNPS designed for Kosmos-954-type satellites and for the SNPS Topaz. Some aspects of possible collisions of SNPSs with space debris in near-earth orbits are examined. I.E.

A92-52827
NEW CRYOGENIC METHODS AND MEANS FOR OBTAINING RAREFIED FLOWS IN VACUUM INSTALLATIONS
S. B. SVIRCHEVSKII (Moscow Aviation Institute, Russia), V. I. KUPRIIANOV, and V. E. KURTASHIN (Cryogenmash, Moscow, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 8 p refs
Copyright

Methods and experimental equipment for studying, under simulated rarefied-flow conditions, the mass transfer near a spacecraft of complex configuration are considered. Special attention is given to the algorithms used for calculating the internal free-molecular flows and the distribution of the molecular flow density at the spacecraft surface. The design of a high-range cell for high vacuum cryogenic pumps is described, and the features of cryosorption vacuum pumps for simulation test are examined. Relevant experimental and analytical data are presented. I.S.

N92-13947*# Kazan State Univ. (USSR). Dept. of Applied Mathematics.
OPTIMIZATION OF THE HEATING SURFACE SHAPE IN THE CONTACT MELTING PROBLEM
SERGEI A. FOMIN (Kazan State Univ. (USSR).) and SHANGMO CHENG (Huazhong Univ. of Science and Technology, Wuhan, China) *In* Pennsylvania State Univ., Third International Conference on Inverse Design Concepts and Optimization in Engineering Sciences (ICIDES-3) p 253-262 1991
Avail: CASI HC A02/MF A06

The theoretical analysis of contact melting by the migrating heat source with an arbitrary shaped isothermal heating surface is presented. After the substantiated simplification, the governing equations are transformed to the convenient equations for engineering calculations relationships. Analytical solutions are used for numerical prediction of optimal shape of the heating surface. The problem is investigated for the constant and for temperature dependent physical properties of the melt. Author

N92-13966*# Moscow Inst. of Aviation Technology (USSR). Dept. of Space System Engineering and Design.
INVERSE PROBLEMS IN THE DESIGN, MODELING AND TESTING OF ENGINEERING SYSTEMS
OLEG M. ALIFANOV *In* Pennsylvania State Univ., Third International Conference on Inverse Design Concepts and Optimization in Engineering Sciences (ICIDES-3) p 495-512 1991
Avail: CASI HC A03/MF A06

Formulations, classification, areas of application, and approaches to solving different inverse problems are considered for the design of structures, modeling, and experimental data processing. Problems in the practical implementation of theoretical-experimental methods based on solving inverse problems are analyzed in order to identify mathematical models of physical processes, aid in input data preparation for design

parameter optimization, help in design parameter optimization itself, and to model experiments, large-scale tests, and real tests of engineering systems. Author

N92-22296# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: ENGINEERING AND EQUIPMENT
2 Jan. 1992 29 p Transl. into ENGLISH from various Russian articles
(JPRS-UEQ-92-001) Avail: CASI HC A03/MF A01
A bibliography is given of U.S.S.R. research in engineering and equipment. Topics covered include nuclear energy; non-nuclear energy; turbines; engines propulsion systems; the mechanics of gases, liquids, and solids; and industrial planning, technology, and productivity. Author

N92-22297# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: ENGINEERING AND EQUIPMENT
29 Oct. 1991 16 p Transl. into ENGLISH from various Russian articles
(JPRS-UEQ-91-011) Avail: CASI HC A03/MF A01
A bibliography is given of U.S.S.R. research in engineering and equipment. Topics covered include aviation, space technology, optics, high energy devices, nuclear energy, and industrial technology, planning, and productivity. Author

N92-22298# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: ENGINEERING AND EQUIPMENT
31 Jan. 1992 33 p Transl. into ENGLISH from various Russian articles
(JPRS-UEQ-92-002) Avail: CASI HC A03/MF A01
A bibliography is given of U.S.S.R. research in engineering and equipment. Topics covered include aviation, space technology, optics, high energy devices, nuclear energy, electric power transmission lines, and industrial technology, planning, and productivity. Author

N92-22397# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: ENGINEERING AND EQUIPMENT
6 Sep. 1991 26 p Transl. into ENGLISH of various Russian articles
(JPRS-UEQ-91-010) Avail: CASI HC A03/MF A01
A bibliography is given of U.S.S.R. research in engineering and equipment. Topics covered include optics; high energy devices; nuclear and non-nuclear energy; the mechanics of gases, liquids, and solids; and industrial technology, planning, and productivity. Author

N92-23708# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: MATERIALS SCIENCE
26 Mar. 1992 54 p Transl. into ENGLISH from various Russian articles
(JPRS-UMS-92-005) Avail: CASI HC A04/MF A01
A bibliography of Central Eurasian research in materials science is given. Topics covered include analysis and testing; coatings; composite materials; ferrous and nonferrous alloys, brazes and solders; industrial processes; preparations and metal treatments; and welding, brazing, and soldering. Author

N92-23709# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: MATERIALS SCIENCE
31 Mar. 1992 28 p Transl. into ENGLISH from various Russian articles
(JPRS-UMS-92-006) Avail: CASI HC A03/MF A01
A bibliography is given of Central Eurasian research in materials science. Topics covered include analysis and testing; corrosion resistance; ferrous metals; nonferrous alloys, brazes, and solders; heat treatment; welding, brazing, and soldering; and extractive metallurgy. Author

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COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications.

A92-10109
SIMULTANEOUS MEASUREMENTS OF THE POLARIZATION, ANGLES OF ARRIVAL, DOPPLER FREQUENCY, AND AMPLITUDE OF THE VHF RADIO SIGNAL FROM ETS 2
E. L. AFRAIMOVICH, N. P. MIN'KO, A. N. SHAPOVALOV, and V. N. ZVEZDIN (Sibirskii IZMIRAN, Irkutsk, USSR) Radio Science (ISSN 0048-6604), vol. 26, Sept.-Oct. 1991, p. 1177-1198. Oct. 1991 22 p refs
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This paper gives a description of the transionspheric radiosonde (TIR) designed for simultaneous measurements of the main parameters of the ETS 2 radio signal at 136 MHz (polarization, angles of arrival, frequency Doppler shift, and amplitude, with a time resolution of 30 s; amplitude scintillations using spaced antennas with a resolution of 0.2 s). These data, referenced to exact time, are stored on magnetic tape and diskettes for the purpose of making a subsequent digital processing on a PDP-11 computer and personal computers. Data from the TIR radio interferometer can be useful when studying the dynamics of a geostationary satellite in orbit; when making a complex study of the transionospheric propagation of radio waves; and when studying the structure, dynamics, interaction, and transformation of ionospheric irregularities simultaneously in a wide range of scales (from 100 m to 1000 km). Author

A92-12822
OPTIMAL JOINT CONTROL OF TIME AND ENERGY RESOURCES IN PROBLEMS OF SIGNAL DETECTION BY MULTIBEAM SYSTEMS [OPTIMAL'NOE SOVMESTNOE UPRAVLENIE VREMENNYM I ENERGETICHESKIM RESURSAMI V ZADACHAKH OBNARUZHENIIA SIGNALOV MNOGOLUCHEVYMI SISTEMAMI]
P. E. BARANOV, A. S. MURANOV, and A. N. SHEIK-SEIKIN Radiotekhnika (ISSN 0033-8486), Sept. 1991, p. 65-67. In Russian. Sep. 1991 3 p In RUSSIAN refs
Copyright
An algorithm for the joint control of the number of pulses and the pulse energy for the case of sequential-parallel survey is synthesized in accordance with the Bayesian criterion. An analysis is made of the efficiency of the proposed algorithm in comparsion with algorithms involving control of only a single parameter and with uncontrolled (uniform) distribution. The results are of interest in connection with the enhancement of the noise immunity of a radar system when the total energy resources are limited. L.M.

A92-14288
OPTIMAL CONTROL OF THE FREQUENCY-TIME REGIMES OF MULTICHANNEL RADAR STATIONS [OPTIMAL'NOE UPRAVLENIE CHASTOTNO-VREMENNYMI REZHIMAMI RABOTY MNOGOKANAL'NYKH RLS]
V. V. KHUTORTSEV Radioelektronika (ISSN 0021-3470), vol. 34, Aug. 1991, p. 37-41. In Russian. Aug. 1991 5 p In RUSSIAN refs
Copyright
An optimal law is synthesized for the control of the frequency-time regime of a multichannel radar with an electronically controlled radiation pattern and time separation of channels. The approach adopted here takes advantage of the invariant-group properties of discrete-continuous filtering algorithms. An example illustrating the approach is presented. V.L.

A92-14289
A STUDY OF THE PROPERTIES OF THE CROSS-AMBIGUITY FUNCTION OF COMPOSITE MULTIPHASE SIGNALS [ISSLEDOVANIE SVOISTV VFN SOSTAVNYKH MNOGOFAZNYKH SIGNALOV]
V. M. KOSHEVOI and V. I. KUPROVSKII Radioelektronika (ISSN 0021-3470), vol. 34, Aug. 1991, p. 63-66. In Russian. Aug. 1991 4 p In RUSSIAN refs
Copyright
In order to analyze the fine structure of the cross-ambiguity function, a study was made of composite multiphase signals with different ratios of the number of base and external pulses but with a constant product of the number of pulses in the two sequences. The analysis demonstrates the possibility of a continuous change in the structure of the cross-ambiguity function over a wide range. The results can be useful in solving various applied problems involving the use of composite signals and, in particular, for the adaptive control of the modulation of composite multiphase signals. V.L.

A92-28399
ELECTROMAGNETIC WAVE SCATTERING ON A HALF-PLANE WITH NONLINEAR LOADS [RASSEIANIE ELEKTROMAGNITNYKH VOLN NA POLUPLOSKOSTI S NELINEINYMI NAGRUZKAMI]
B. M. PETROV and D. V. SEMENIKHINA Radioelektronika (ISSN 0021-3470), vol. 34, Nov. 1991, p. 98-100. In Russian. Nov. 1991 3 p In RUSSIAN refs
Copyright
A solution to the excitation problem for a half-plane with nonlinear loads, obtained in a previous study (Mitrofanova, 1989) is applied to the particular case of nonlinear scattering on a half-plane (i.e., the case where the source is located at infinity). It is found that the amplitudes of the higher harmonics of the scattered field depend to a large degree on the coefficient of the quadratic terms of the volt-ampere characteristic. By appropriately selecting the volt-ampere characteristic coefficient of the load, it is possible to obtain nonlinear scatterers with different properties (e.g., they may scatter only odd or even or both odd and even field harmonics). V.L.

A92-31710#
DESIGN OF TELECOMMUNICATIONS SATELLITE SYSTEMS - THE USSR EXPERIENCE
GRIGORII M. CHERNIAVSKII (Russian Academy of Sciences, Moscow, Russia) AIAA, International Communication Satellite Systems Conference and Exhibit, 14th, Washington, DC, Mar. 22-26, 1992. 7 p. Mar. 1992 7 p refs
(AIAA PAPER 92-2016) Copyright
A review is presented of the various operational satellite communications systems developed in the USSR for both military and civilian users. All of these systems employed active-relay type spacecraft operating in geostationary, high elliptic, and low earth orbits. Particular attention is given to the Gorizont and Ekran series of satellites. R.E.P.

A92-33743
ESTIMATION OF THE EFFECT OF THE PHASE-NOISE PROPERTIES OF THE INSTRUMENTATION ON SYNTHETIC-APERTURE-RADAR RESOLUTION [OTSENKA VLIIANIIA SVOISTV FAZOVOGO SHUMA APPARATURY NA RAZRESHENIE RADIOLOKATORA S SINTEZIROVANIEM APERTURY]
O. V. SYTNIK Radiotekhnika (Kharkov) (ISSN 0485-8972), no. 92, 1990, p. 67-73. In Russian. 1990 7 p In RUSSIAN refs
Copyright

A92-42321
SOME RESULTS ON INTERFERENCE SUPPRESSION ON ELECTROMAGNETICALLY DENSE PLATFORMS
KOSTAS K. VENSKAUSKAS (Central Marine Research and Development Institute, St. Petersburg, Russia) and GENNADII P. BOGOMOLOV (Black Sea Shipping Co., Odessa, Ukraine) IN: 1991 IEEE International Symposium on Electromagnetic Compatibility, Cherry Hill, NJ, Aug. 12-16, 1991, Symposium Record 1991 5 p refs
Copyright
An interference cancellation systems based on theoretical considerations were constructed to suppress interference at receiver input induced from one or more high-power transmitters and to permit collocation of the receiver and transmitter. The fundamental characteristics and field test performance of the interference cancellation systems have a good possibility of being put into practical use. Author

A92-53807
DECORRELATION OF MULTIPATH SIGNALS IN ADAPTIVE ANTENNAS WITH FREQUENCY-DOMAIN PROCESSING [O DEKORRELIATSII MNOGOLUCHEVYKH SIGNALOV PRI REALIZATSII OBRABOTKI V ADAPTIVNYKH ANTENNAKH V CHASTOTNOI OBLASTI]
G. V. LOSKUTOVA and V. O. SHEVELEVA Radiotekhnika i Elektronika (ISSN 0033-8494), vol. 37, no. 2, Feb. 1992, p. 240-246. In Russian. Feb. 1992 7 p In RUSSIAN refs
Copyright
The paper examines the decorrelation of multipath-signal components arising in wideband adaptive arrays during the realization of frequency-domain processing on the basis of the Fourier transformation of time realizations of a finite-length field. An analysis is made of the quantitative characteristics of the decorrelation effect and its influence on the angular resolution of the adaptive array under multipath conditions. L.M.

A92-53809
OPTIMIZATION OF ALGORITHMS OF COMPLEX PROCESSING OF PULSED RADIO SIGNALS ON THE BASIS OF A MULTISTAGE SOLUTION OF THE STRATONOVICH EQUATION [OPTIMIZATSIIA ALGORITMOV KOMPLEKSNOI OBRABOTKI IMPUL'SNYKH RADIOSIGNALOV NA OSNOVE POETAPNOGO RESHENIIA URAVNENIIA STRATONOVICHA]
M. S. IARLYKOV and V. IU. SHISHKIN Radiotekhnika i Elektronika (ISSN 0033-8494), vol. 37, no. 2, Feb. 1992, p. 260-269. In Russian. Feb. 1992 10 p In RUSSIAN refs
Copyright
The Markov theory of optimal estimation of random processes is used to examine the synthesis of algorithms of optimal complex nonlinear processing of pulsed and discrete (continuous) signals based on the multistage solution of the Stratonovich equation. It is shown that the solution of this problem is obtainable in two stages: the problem of optimal parameter estimation is solved in the first stage, while the problem of optimal linear estimation is solved in the second. An example illustrating the effectiveness of the proposed synthesis method is presented. L.M.

A92-53821
EFFECT OF THICKNESS FLUCTUATIONS OF THE PLASMA (IONOSPHERIC) REFLECTING LAYER ON THE STATISTICAL CHARACTERISTICS OF THE REFLECTED SIGNAL (NEAR CRITICAL FREQUENCY) [VLIIANIE FLUKTUATSII TOLSHCHINY OTRAZHAIUSHCHEGO SLOIA PLAZMY /IONOSFERY/ NA STATISTICHESKIE KHARAKTERISTIKI OTRAZHENNOGO SIGNALA /VBLIZI KRITICHESKOI CHASTOTY/]
V. K. BERGER Radiotekhnika i Elektronika (ISSN 0033-8494), vol. 37, no. 4, April 1992, p. 689-693. In Russian. Apr. 1992 5 p In RUSSIAN refs
Copyright
Based on the exact solution for wave reflection from a parabolic layer of an absorbing plasma, the paper examines the effect of thickness fluctuations of the reflecting ionospheric layer on the statistical characteristics of the reflected signal near the operating and critical frequencies. Graphs are presented which illustrate the dependence of the means and variances of the modulus and phase of the reflection coefficient on various parameters, including absorption, and the difference of the operating and critical frequencies. L.M.

A92-53895
ANALYSIS OF THE CAPABILITIES OF MULTIPURPOSE RADAR SYSTEMS FOR EARTH IMAGING FROM SPACE [ANALIZ VOZMOZHNOSTEI MNOGOTSELEVYKH RADIOLOKATSIONNYKH SISTEM DISTANTSIONNOGO ZONDIROVANIIA ZEMLI IZ KOSMOSA]
A. I. KALMYKOV, O. V. SYTNIK, and V. N. TSYMBAL Radioelektronika (ISSN 0021-3470), vol. 35, no. 4, April 1992, p. 18-25. In Russian. Apr. 1992 8 p In RUSSIAN refs
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The paper deals with the problem of optimizing spaceborne imaging radar systems in order to maximize the information value of the observations and to expand the system's functional capabilities. The existing and future radar systems for earth imaging from space are examined. A generalized optimality criterion is proposed which makes it possible to optimize a system for maximum information content for given constraints on the technical parameters of the system. V.L.

N92-13971*# Academy of Sciences (USSR), Moscow. Inst. for Problems in Mechanics.
INVERSE PROBLEMS IN DIFFRACTION
ANDREW G. MIKHEEV and ALEKSEY S. SHAMAEV *In* Pennsylvania State Univ., Third International Conference on Inverse Design Concepts and Optimization in Engineering Sciences (ICIDES-3) p 563-572 1991
Avail: CASI HC A02/MF A06

A two-dimensional problem of diffraction of a plane electromagnetic wave on a smooth 2 pi-periodic surface is considered. A numerical algorithm solving this problem is developed. An inverse problem of determination of the shape of 2 pi-periodic surface using the performance data of reverse scattering is considered. The inverse problem was solved by means of minimization of the residual functional with the help of the gradient descent method. The initial data were calculated with the help of the numerical method. On each step of the iterative method of minimization, the residual functional was calculated approximately with the help of the small slope method. The examples of the shape determination are considered. Author

N92-15217# Ministry of Posts and Telecommunications, Moscow (USSR).
TRENDS IN SATELLITE COMMUNICATION AND BROADCASTING SYSTEM DEVELOPMENT IN THE USSR
LEV. YAKOVLEVICH KANTOR and M. M. SIMONOV *In* ESA, Second European Conference on Satellite Communications ECSC-2 p 35-39 Oct. 1991
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 90 Dutch guilders

The present state of satellite telecommunication and broadcasting in the USSR, the possibilities and prospects of further development of direct multiprogram television broadcasting, sound broadcasting, and national and international satellite communication systems are considered. The parameters of the existing and planned BSS (Broadcasting Satellite Service) and FSS (Fixed Satellite Service) satellites are discussed and the present launching systems such as Proton and Energy launchers are described. Some problems related to economical efficiency of satellite communication systems based on the concept of minimum expenses on the Earth and space segments are considered as well as the matters of an efficient utilization of the Geostationary Satellite Orbit (GSO) capacity by small earth stations. ESA

N92-31920# Science Applications International Corp., San Diego, CA. Foreign Applied Sciences Assessment Center.
SOVIET SATELLITE COMMUNICATIONS SCIENCE AND TECHNOLOGY
J. N. BIRCH, S. J. CAMPANELLA, G. S. GORDON, D. R. MCELROY, and W. L. PRITCHARD Aug. 1991 161 p
(PB92-173038) Avail: CASI HC A08/MF A02

The current state of the art and projections of future Soviet satellite communications technologies are discussed. A panel of six U.S. scientists and engineers assessed the Soviet ability to support high-data-rate space missions at 128 Mbps by evaluating current and projected Soviet satellite communications technologies. A variety of space missions were considered, including Earth-to-Earth communications via satellites in geostationary or highly elliptical orbits, those missions that require space-to-Earth communications via a direct path, and those missions that require space-to-Earth communications via a relay satellite. Soviet satellite communications capability, in most cases, is 10 years behind that of the United States and other industrialized nations such as Japan, Italy, and France. However, based upon an analysis of communications links needed to support these missions, using current Soviet capabilities, it is well within the current Soviet technology to support certain space missions outlined above at rates of 128 Mbps or higher, although the published literature clearly shows that the Soviet Union has not exceeded 60 Mbps in its current space system. In response to decreased governmental support, the Soviet communications satellite industry is showing signs of some internal competition, is working on increasing communications satellite lifetime, and is also striving to develop joint ventures with Western firms. Author

N92-70284 Academy of Sciences of the Ukrainian SSR, Kharkov. Fiziko-Tekhnicheskij Inst.
ON THE CALCULATION OF AXISYMMETRIC ELECTROMAGNETIC FIELDS WITH FINITE ELEMENT METHOD
V. N. OSTROUSHKO and V. G. PAPKOVICH 1988 7 p In RUSSIAN
(DE91-645784; KFTI-88-55) Avail: CASI HC A02/MF A01

A variant of finite element method, where the ratio of azimuthal field component to the distance from the axis is presented in the form of a polynomial, has been developed for the calculation of axisymmetric electromagnetic vibrations. Formulas for matrix elements, generated by a variational problem, were obtained, and a method of imposing boundary conditions on the axis was described. The program, realizing the given algorithms, is written in FORTRAN. Program testing, conducted for resonators of relatively simple configuration, demonstrated its more effective operation, as compared to programs described in publications. DOE

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ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

A92-13768
A METHOD FOR MEASURING RADIATION-INDUCED ELECTRICAL CONDUCTIVITY DURING THE MODELING OF THE EFFECT OF PROTONS ON DIELECTRICS IN SPACE [METODIKA IZMERENIIA RADIATSIONNOI ELEKTROPROVODNOSTI PRI MODELIROVANII VOZDEISTVIIA NA DIELEKTRIKI PROTONOV V KOSMICHESKOM PROSTRANSTVE]
A. I. AKISHIN, N. M. DUNAEV, and IU. I. TIUTRIN Fizika i Khimiia Obrabotki Materialov (ISSN 0015-3214), Sept.-Oct. 1991, p. 55-59. In Russian. Oct. 1991 5 p In RUSSIAN
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A method for measuring the radiation-induced electrical conductivity of dielectrics is proposed which involves measuring the voltage of a capacitor battery as a function of the number of proton (electron) current pulses incident on the dielectric connected into the discharge circuit of the capacitor battery. The method provides fast measurements and is suitable for specimens of relatively large length, which is limited only by the particle free path length. V.L.

A92-16768
PARAMETRIC INTERACTIONS IN MAGNETODIELECTRIC RESONATORS [PARAMETRICHESKIE VZAIMODEISTVIIA V MAGNITODIELEKTRICHESKIKH REZONATORAKH]
G. V. BELOKOPYTOV (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Radiofizika (ISSN 0021-3462), vol. 34, March 1991, p. 292-300. In Russian. Mar. 1991 9 p In RUSSIAN refs
Copyright
Parametric interactions between electromagnetic waves in resonators with dielectric and magnetic nonlinearities are investigated analytically with allowance for magnetodielectric effects, gyrotropy, and dispersion of the nonlinear medium characteristics. It is shown that, in ferromagnetics, parametric excitation results from the combined effect of a variety of nonlinear mechanisms, and that these mechanisms are difficult to separate. V.L.

A92-16891
MINIMIZATION OF STARTUP CURRENTS IN RELATIVISTIC MICROWAVE DEVICES [MINIMIZATSIIA STARTOVYKH TOKOV V RELIATIVISTSKIKH SVCH PRIBORAKH]
V. I. ROZENTSVEIG, A. V. SMORGONSKII, and I. M. STAROBINETS (AN SSSR, Institut Prikladnoi Fiziki, Gorki, USSR) Zhurnal Tekhnicheskoi Fiziki (ISSN 0044-4642), vol. 61, March 1991, p. 108-116. In Russian. Mar. 1991 9 p In RUSSIAN refs
Copyright
A study is made of the effect of the structure of the high-frequency field along the interaction space on the startup regimes of oscillators with relativistic electron beams. In particular, startup current minimization problems are formulated and solved for several models of microwave devices. An approach to startup current minimization is proposed whereby the electrodynamic system is separated into an easily excitable oscillator section and a takeoff (amplification) section characterized by efficient energy exchange between the electron beam and the wave field. V.L.

A92-21608
ANALYSIS OF RANDOM OSCILLATIONS OF THE PHASE OF A SYNCHRONIZED VAN DER POL OSCILLATOR WITH DELAY FEEDBACK AND A FLUCTUATING PARAMETER [ANALIZ SLUCHAINYKH KOLEBANII FAZY SINKHRONIZIROVANNOGO OSTSILLIATORA VAN-DER-POLIA S ZAPAZDYVAIUSHCHEI OBRATNOI SVIAZ'IU I FLUKTUIRUIUSHCHIM PARAMETROM]
O. L. SIROTKIN Radiotekhnika i Elektronika (ISSN 0033-8494), vol. 36, Dec. 1991, p. 2368-2371. In Russian. Dec. 1991 4 p In RUSSIAN refs
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A92-21611
ANOMALOUS EMISSION FROM DIELECTRICS IN INTENSE FIELDS [ANOMAL'NAIA EMISSIIA DIELEKTRIKOV V SIL'NYKH POLIAKH]
E. A. BESEDINA and M. V. KREMKOV Radiotekhnika i Elektronika (ISSN 0033-8494), vol. 36, Dec. 1991, p. 2418-2420. In Russian. Dec. 1991 3 p In RUSSIAN refs
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The anomalous emission of electrons from dielectric coatings in intense electric fields was investigated for the Mg-Ta, NaCl-Ta, and Ta-NaCl-Ni systems. The results obtained are of interest in connection with the charging of spacecraft surfaces, especially under conditions when an intense electric field (10 exp 6 to 10 exp 7 V/cm and higher) arises between the dielectric surface and the metal casing. The results are analogous to those obtained in investigations of the electric breakdown of solar-array elements and brightening coatings under irradiation. L.M.

A92-23474
POWER CONSTRAINTS ON STOCHASTIC MODELS OF TRANSISTORIZED RADIO TRANSMITTER COMPLEXES [ENERGETICHESKIE OGRANICHENIIA STOKHASTICHESKIKH MODELEI TRANZISTORNYKH RADIOPEREDAIUSHCHIKH KOMPLEKSOV]
V. N. KOTLIAROV (Leningradskii Elektrotekhnicheskii Institut, Leningrad, USSR) Elektronnoe Modelirovanie (ISSN 0204-3572), vol. 13, Nov.-Dec. 1991, p. 54-59. In Russian. Dec. 1991 6 p In RUSSIAN refs
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The paper is concerned with the problem of optimizing the power regime of the transistorized oscillator cascades of short-wave radio transmitter complexes with parameters that are indeterminate within certain limits. The problem is stated for a model radio transmitter complex consisting of three principal components. The localization of solutions for partial boundary value problems and generation of the vector of variable parameters are discussed. An example of the calculation of an active phase array is presented. V.L.

A92-23619
THE VIRTUAL IMPEDANCE METHOD FOR THE SYNTHESIS OF DIFFERENTIAL PHASE-SHIFTERS AND ATTENUATORS OF REFLECTION TYPE [METOD VIRTUAL'NOGO IMPEDANSA DLIA SINTEZA DIFFERENTSIAL'NYKH FAZOVRASHCHATELEI I ATTENIUATOROV OTRAZHATEL'NOGO TIPA]
A. S. PETROV Radioelektronika (ISSN 0021-3470), vol. 34, Oct. 1991, p. 53-58. In Russian. Oct. 1991 6 p In RUSSIAN refs
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A92-23620
PHASE-OPTIMIZED ANALOG REFLECTION-TYPE PHASE-SHIFTER [ANALOGOVYI OTRAZHATEL'NYI FAZOVRASHCHATEL', OPTIMIZIROVANNYI PO FAZE]
O. P. BONDARENKO and A. S. MAKARENKO Radioelektronika (ISSN 0021-3470), vol. 34, Oct. 1991, p. 58-62. In Russian. Oct. 1991 5 p In RUSSIAN refs
Copyright
A method for the synthesis of a phase-optimized varactor-diode-based reflection-type microwave phase-shifter is examined. Recommendations on extending the band of operating frequencies with simultaneous reduction of the phase error are elaborated. An optimized phase-shifter is described which guarantees a change in the phase shift within the 0-90 deg range with an error of not more than +/-3.4 deg in the octave frequency band. L.M.

A92-25984
CRITICAL BEHAVIOR OF THE JOSEPHSON FREQUENCY OF SUPERCONDUCTING COMPOSITES [KRITICHESKOE POVEDENIE DZHOZEFSONOVSKOI CHASTOTY SVERKHPROVODIASHCHIKH KOMPOZITOV]
A. E. MOROZOVSKII (AN USSR, Institut Metallofiziki, Kiev, Ukrainian SSR) Pis'ma v Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki (ISSN 0370-274X), vol. 54, Nov. 10, 1991, p. 496-498. In Russian. 10 Nov. 1991 3 p In RUSSIAN refs
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A new effect is predicted for superconducting composites, which consists in the dependence of the frequency of Josephson radiation on the concentration of the superconducting phase. A critical index of the concentration dependence of the Josephson frequency is introduced which is defined on the basis of the 'weak link' model. L.M.

A92-30391
FINITE-ELEMENT ANALYSIS OF WAVEGUIDE STRUCTURES WITH A COMPLEX CROSS-SECTION SHAPE, PARTIALLY FILLED WITH TRANSVERSELY MAGNETIZED FERRITE [KONECHNO-ELEMENTNYI ANALIZ VOLNOVEDUSHCHIKH STRUKTUR SO SLOZHNOI FORMOI POPERECHNOGO SECHENIIA, CHASTICHNO ZAPOLNENNYKH POPERECHNO-NAMAGNICHENNYM FERRITOM]
S. M. AVDEEV, V. B. ALEKSEEV, and N. R. RUDENKO Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriia Priborostroenie (ISSN 0236-3933), July-Sept. 1991, p. 4-11. In Russian. Sep. 1991 8 p In RUSSIAN refs
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A92-30407
A THREE-DEGREE-OF-FREEDOM ELECTROMECHANICAL TRANSDUCER IN THE SPACECRAFT ANGULAR STABILIZATION SYSTEM [TREKHSTEPENNOI ELEKTROMEKHANICHESKII PREOBRAZOVATEL' V SISTEME UGLOVOI STABILIZATSII KOSMICHESKOGO APPARATA]
E. V. DVOINYKH (Kievskii Politekhnicheskii Institut, Kiev, Ukraine) Tekhnicheskaia Elektrodinamika (ISSN 0204-3599), May-June 1991, p. 46-52. In Russian. Jun. 1991 7 p In RUSSIAN refs
Copyright
The possibility of using hydraulic drives based on a 3-DOF electromechanical transducer in the distributed angular stabilization system of spacecraft is investigated. The principle of stabilizing moment synthesis is described for different distributions of the elementary kinetic moment carriers of the angular stabilization system over the spacecraft volume. Some practical recommendations concerning the use of a 3-DOF electromechanical transducer in spacecraft stabilization applications are given. V.L.

A92-31905
MOTORS WITH HIGH TEMPERATURE SUPERCONDUCTING LEVITATION [DVIGATELI S VTSP PODVESOM]
M. A. VASIL'EV and A. S. FILIPPOV (AN Ukrainy, Institut Metallofiziki, Kiev, Ukraine) (Vsesoiuznoe Soveshchanie po Vysokotemperaturnoi Sverkhprovodimosti, 3rd, Kharkov, Ukraine, Apr. 15-19, 1991) Fizika Nizkikh Temperatur (ISSN 0132-6414), vol. 17, Nov.-Dec. 1991, p. 1456-1459. In Russian. Dec. 1991 4 p In RUSSIAN refs
Copyright
Motor designs are proposed which employ stable levitation of Sm-Co permanent magnets over YBa2Cu3O(7-x) high temperature superconductor (HTSC) ceramic at the liquid nitrogen temperature. The levitating suspension of the rotor, consisting of one or several permanent magnets, in an HTSC bearing is achieved due to the Meissner effect. Stabilization of the rotation axis in the longitudinal and transverse directions is achieved as a result of the pinning of magnetic vortices in the HTSC. V.L.

A92-31907
A FOUR-CIRCUIT HIGH TEMPERATURE SUPERCONDUCTOR SQUID WITH A MAGNETIC FIELD RESOLUTION OF 7 X 10 EXP -14 T HZ EXP -0.5 [CHETYREKHKONTURNYI VTSP SKVID S RAZRESHENIEM PO MAGNITNOMU POLIU 7 X 10 EXP -14 TL GZ EXP -0.5]
IU. A. TAVRIN, V. A. PAVLIUK (AN Ukrainy, Fiziko-Tekhnicheskii Institut Nizkikh Temperatur, Kharkov, Ukraine), A. K. SHIKOV, and N. E. KHLEBOVA (VNII Neorganicheskikh Materialov, Moscow, Russia) (Vsesoiuznoe Soveshchanie po Vysokotemperaturnoi Sverkhprovodimosti, 3rd, Kharkov, Ukraine, Apr. 15-19, 1991) Fizika Nizkikh Temperatur (ISSN 0132-6414), vol. 17, Nov.-Dec. 1991, p. 1462-1464. In Russian. Dec. 1991 3 p In RUSSIAN
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The design, fabrication, and electrical characteristics of a four-circuit SQUID produced from a high temperature superconducting ceramic, YBa2Cu3O(7-x), are presented. At an operating temperature of 77 K, the sensitivity of the device to an external magnetic field was measured at 7 x 10 exp -14 T x Hz exp -0.5. The results of the study demonstrate the feasibility of producing highly efficient three-dimensional dc SQUIDs from high temperature superconducting ceramics. V.L.

A92-31913
THE CURRENT STATUS OF HIGH TEMPERATURE SUPERCONDUCTING WIRES [SOSTOIANIE RAZRABOTKI VTSP PROVODOV NA SOVREMENNOM ETAPE]
B. P. MIKHAILOV and G. S. BURKHANOV (Rossiiskaia Akademiia Nauk, Institut Metallurgii, Moscow, Russia) (Vsesoiuznoe Soveshchanie po Vysokotemperaturnoi Sverkhprovodimosti, 3rd, Kharkov, Ukraine, Apr. 15-19, 1991) Fizika Nizkikh Temperatur (ISSN 0132-6414), vol. 17, Nov.-Dec. 1991, p. 1483-1488. In Russian. Dec. 1991 6 p In RUSSIAN refs
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The principal technological difficulties associated with the manufacture of high temperature superconducting (HTSC) wires based on yttrium and lanthanum ceramics are briefly reviewed. It is noted that the superconducting and mechanical properties of HTSC wires or ribbons are largely determined by their microstructure. Particular attention is given to the currently used method of producing HTSC wires whereby the ceramic powder is encased in a pipe shell and then deformed by different methods, such as rolling, drawing, or pressing. The requirements for the shell material are examined, and current densities are presented for HTSC wires produced in shells of copper, silver, aluminum, nickel, stainless steel, and zirconium. V.L.

A92-33796
DESIGN OF HIGH-Q RESONANCE NUMERICAL FILTERS [PROEKTIROVANIE REZONANSNYKH TSIFROVYKH FIL'TROV VYSOKOI DOBROTNOSTI]
V. A. POGRIBNOI and V. N. SEMOTIUK Otbor i Obrabotka Informatsii (ISSN 0474-8662), no. 7, 1991, p. 78-81. In Russian. 1991 4 p In RUSSIAN refs
Copyright
The use of high-Q resonance filters with a linear phase-frequency characteristic is essential for data acquisition and processing in spectral analysis. Here, recommendations are presented concerning the selection of the optimal parameters of high-Q filters. Two methods for the analysis of nonrecursive filters with a linear phase-frequency characteristic, weighing and frequency sampling, are described and compared. V.L.

A92-52217
GENERATION AND TRANSPORT OF 140 KJ RIBBON ELECTRON BEAM
A. V. ARZHANNIKOV, V. S. NIKOLAEV, S. L. SINITSKII, A. V. SMIRNOV, M. V. IUSHKOV, and R. P. ZOTKIN (Russian Academy of Sciences, Institute of Nuclear Physics, Novosibirsk, Russia) Journal of Applied Physics (ISSN 0021-8979), vol. 72, no. 4, Aug. 15, 1992, p. 1657-1659. 15 Aug. 1992 3 p refs
Copyright
Generation of a microsecond ribbon electron beam with a strongly elongated cross section 4 cm x 140 cm in a magnetically insulated diode at 1 MV voltage and its transport at the distance 2 m in a slit vacuum channel with a guiding magnetic field about 1 T are described. High efficiency of the ribbon beam generation and transport at the total energy about 140 kJ is experimentally proven. Author

A92-53810
EXPERIMENTAL APPARATUS FOR THE FORMATION OF A HIGH-POWER FOCUSED MICROWAVE BEAM IN FREE SPACE [EKSPERIMENTAL'NAIA USTANOVKA DLIA FORMIROVANIIA MOSHCHNOGO SFOKUSIROVANNOGO POTOKA SVCH-IZLUCHENIIA V SVOBODNOM PROSTRANSTVE]
G. I. BATSKIKH and IU. I. KHVOROSTIANOI Radiotekhnika i Elektronika (ISSN 0033-8494), vol. 37, no. 2, Feb. 1992, p. 311-315. In Russian. Feb. 1992 5 p In RUSSIAN
Copyright
The characteristics and functional capabilities of an experimental apparatus for the focusing of high-power microwave

beams in free space are discussed. The apparatus comprises a 192-channel transmitting device operating on a symmetric horn array and providing cophase composition of radiation inside the experimental chamber in the cm-wavelength range (7 GHz). The main element of each channel is a 100-kW amplifying klystron.
L.M.

A92-53925
PHYSICAL PROCESSES IN SUPERCONDUCTOR DEVICES [FIZICHESKIE PROTSESSY V SVERKHPROVODIASHCHIKH USTROISTVAKH]
A. I. GOLOVASHKIN, ED. Moscow, Izdatel'stvo Nauka (FIAN, Trudy. Vol. 205), (ISSN 0203-5820), 1991, 184 p. In Russian. No individual items are abstracted in this volume. 1991 184 p In RUSSIAN
(ISBN 5-02-000111-2) Copyright
The papers contained in this volume focus on the results of theoretical and experimental studies of thermal and electromagnetic processes occurring in superconducting magnets and their mechanical properties. Topics discussed include the kinetics of the transition of a superconducting coil to the normal state, a method for calculating elastic stresses and strains in a superconducting solenoid with a layered structure, effect of coil deformation on the training of superconducting magnets, and diagnostics of magnet heating during the superconducting-normal transition. The discussion also covers a mechanical tester for superconductors and superconducting solenoids, probability distribution of the calculated value of the operating current of superconducting magnets, and using diodes operating at low temperatures in superconducting magnet systems. V.L.

N92-15313# Academy of Sciences of the Ukrainian SSR, Kharkov. Fiziko-Tekhnicheskij Inst.
NON-STATIONARY THEORY OF RELATIVISTIC CARCINOTRON WITH ADDITIONAL FEEDBACK [NESTATSIONARNAYA TEORIYA RELYATIVISTSKOGO KARSINOTRONA S DOPOINITELNOJ OBRATNOJSVYAZYU]
V. A. BONDARENKO, A. O. OSTROVSKIJ, and YU. V. TKACH 1989 11 p In RUSSIAN
(DE91-624831; KFTI-89-1) Avail: CASI HC A03/MF A01
Consideration is given to results of theoretical study of the influence of additional feedback due to wave reflection on the faces of corrugated waveguide on dynamics of excitation of high-frequency oscillations by a relativistic electron beam. A self-consistent system of equations describing nonlinear dynamics of beam interactions with a corrugated waveguide segment is obtained. Numerical analysis of this system of equations is conducted for different values of beam current and reflection coefficients. It is shown that the introduction of additional feedback in the beam-backward wave system leads to formation of a self-modulation mode of oscillation generation. It is established that the starting current of self-modulation in the system with additional feedback is lower as compared to completely a consistent system. The optimal mode of wave excitation from the viewpoint of achieving the maximal efficiency is determined.
DOE

N92-22292# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: ELECTRONICS AND ELECTRICAL ENGINEERING
26 Jul. 1991 32 p Transl. into ENGLISH from various Russian articles
(JPRS-UEE-91-006) Avail: CASI HC A03/MF A01
A bibliography is given of U.S.S.R. research in electronics and electrical engineering. Topics covered include broadcasting, consumer electronics, circuits, rail transportation, detectors, aerospace electronic systems, industrial electronics, control instrumentation, computers, radio communication, power engineering, electrical insulation, electro-optics, and quantum electronics. Author

N92-22294# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: ELECTRONICS AND ELECTRICAL ENGINEERING
29 Jan. 1991 32 p Transl. into ENGLISH from various Russian articles
(JPRS-UEE-91-001) Avail: CASI HC A03/MF A01
A bibliography is given of U.S.S.R. research in electronics and electrical engineering. Topics covered include consumer electronics, broadcasting, antennas, ionospheric propagation, circuits, industrial electronics, control instrumentation, power engineering, quantum electronics, and electro-optics. Author

N92-22313# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: ELECTRONICS AND ELECTRICAL ENGINEERING
3 Jan. 1991 37 p Transl. into ENGLISH of various Russian articles
(JPRS-UEE-90-013) Avail: CASI HC A03/MF A01
A bibliography is given of USSR research in electronics and electrical engineering. Topics covered include broadcasting, consumer electronics, antennas, wave propagation, optical communication, industrial electronics, communication cable, fiber optics, manufacturing technology, power engineering, quantum electronics, electro-optics, and solid state circuits. Author

N92-22400# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: ELECTRONICS AND ELECTRICAL ENGINEERING
13 Jun. 1991 36 p Transl. into ENGLISH from various Russian articles
(JPRS-UEE-91-004) Avail: CASI HC A03/MF A01
A bibliography is given of U.S.S.R. research in electronics and electrical engineering. Topics covered include broadcasting, consumer electronics, antennas, wave propagation, circuits, rail transportation, computers, telephone service, and power engineering. Author

N92-22403# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: ELECTRONICS AND ELECTRICAL ENGINEERING
26 Mar. 1991 47 p Transl. into ENGLISH from various Russian articles
(JPRS-UEE-91-003) Avail: CASI HC A03/MF A01
A bibliography is given of U.S.S.R. research in electronics and electrical engineering. Topics covered include broadcasting, consumer electronics, circuits, rail transportation, communication networks, computers, and power engineering. Author

N92-70510 Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: ELECTRONICS AND ELECTRICAL ENGINEERING
14 Dec. 1990 39 p Transl. into ENGLISH from various Russian articles
(JPRS-UEE-90-012) Avail: CASI HC A03
A bibliography is given of USSR research in electronics and electrical engineering. Topics covered include antennas, radio wave propagation, circuits, rail transportation, industrial electronics, control instrumentation, power engineering, quantum electronics, and electro-optics. Author

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FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

A92-10875
A POSSIBLE MECHANISM OF THE ALPHA EFFECT [OB ODNOM VOZMOZHNOM MEKHANIZME ALPHA-EFFEKTA]

F. KH. KHAKIMOV, V. G. SMIRNOV, and SH. SH. SHOKIROV (Tadzhikskii Gosudarstvennyi Universitet, Dushanbe, Tadzhik SSR) Akademiia Nauk Tadzhikskoi SSR, Doklady (ISSN 0002-3469), vol. 33, no. 8, 1990, p. 519-522. In Russian. 1990 4 p In RUSSIAN refs

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The rotation of an incompressible turbulent medium is examined as a possible necessary condition for the existence of the alpha effect. The rotation period of the turbulent medium in the present analysis is comparable is its order of magnitude with the characteristic time of small-scale motions. It is shown that the rotation of the medium has a destabilizing effect on the dynamics of median motions in the turbulent medium. It is further shown that the rotation effect is one of the possible factors necessary for the existence of the hydrodynamic alpha effect associated with large-scale structure generation against the background of turbulence. V.L.

A92-10906

MATHEMATICAL MODELING OF NONSTATIONARY TEMPERATURE FIELDS IN MULTILAYER STRUCTURES WITH ALLOWANCE FOR ABLATION AND THERMAL DECOMPOSITION KINETICS [MATEMATICHESKOE MODELIROVANIE NESTATSIONARNYKH TEMPERATURNYKH POLEI V MNOGOSLOINYKH KONSTRUKTSIIAKH S UCHETOM UNOSA I KINETIKI TERMORAZLOZHENIIA]

A. A. POLIAKOV, A. G. TSITSIN, and T. P. IAROSLAVTSEVA (Moskovskii Khimiko-Tekhnologicheskii Institut, Moscow, USSR) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 29, July-Aug. 1991, p. 724-729. In Russian. Aug. 1991 6 p In RUSSIAN refs

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A method and a computer program have been developed for calculating nonstationary temperature fields in multilayer composite shells with allowance for the ablation and kinetics of the thermal decomposition of composite materials. Calculations are presented for carbon composite/metal shells to show that the allowance for the pyrolysis of the materials changes the temperature fields in the structure, which in turn affects the fracture behavior of the shell. V.L.

A92-12156

HEAT TRANSFER DURING SPACECRAFT DESCENT IN THE UPPER ATMOSPHERE WITH ALLOWANCE FOR THE NONEQUILIBRIUM EXCITATION OF MOLECULES [TEPLOPEREDACHA PRI SPUSKE KOSMICHESKIKH APPARATOV V VERKHNEI ATMOSFERE S UCHETOM NERAVNOVESNOGO VOZBUZHDENIIA MOLEKUL]

V. M. DOROSHENKO, N. N. KUDRIAVTSEV, and V. V. SMETANIN (Moskovskii Fiziko-Tekhnicheskii Institut, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 319, no. 2, 1991, p. 399-402. In Russian. 1991 4 p In RUSSIAN refs

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Heat flux to the spacecraft surface is calculated for typical descent conditions for a multiple-use spacecraft. Calculations are carried out in the framework of the equation of a thin viscous shock layer, with allowance for the relaxation of vibrationally excited molecules and electron-excited particles in the cold region of the shock layer. L.M.

A92-12166

FORMATION AND EVOLUTION OF TURBULENCE IN A STRONGLY UNDEREXPANDED SUPERSONIC JET [VOZNIKNOVENIE I RAZVITIE TURBULENTNOSTI V SVERKHZVUKOVOI SIL'NO NEDORASSHIRENNOI STRUE]

S. A. NOVOPASHIN and A. L. PEREPELKIN (AN SSSR, Institut Teplofiziki, Novosibirsk, USSR) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0002-3434), Jan.-Feb. 1991, p. 89-95. In Russian. Feb. 1991 7 p In RUSSIAN refs

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Results of an experimental study of the evolution of flow at the boundary of a supersonic jet at Reynolds numbers corresponding to the laminar-turbulent transition are reported. Coherent structure associated with such flows are identified, and their evolution is discussed. The discussion also includes a description of the laser-based remote diagnostic equipment and methods used in the study. V.L.

A92-12167

MEASUREMENT OF TEMPERATURE AND LONGITUDINAL VELOCITY FLUCTUATION SPECTRA UNDER COMPLEX CONDITIONS [IZMERENIE SPEKTROV TEMPERATURY I PRODOL'NYKH KOLEBANII SKOROSTI V USLOZHNENNYKH USLOVIIAKH]

M. L. PIORO (AN USSR, Institut Tekhnicheskoi Teplofiziki, Kiev, Ukrainian SSR) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0002-3434), Jan.-Feb. 1991, p. 137-139. In Russian. Feb. 1991 3 p In RUSSIAN refs

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The characteristics of thermal and hydrodynamic turbulent boundary layers developing on a flat plate in the absence of external turbulence (Tu approaches zero) were investigated experimentally for dP/dx equal to or greater than zero. The experiments were carried out in a wind tunnel using a heated 800 x 8 mm plate. The mean and pulse flow characteristics were measured by hot-wire anemometry. The spectral distributions of temperature and longitudinal velocity fluctuations are presented in graphic form. V.L.

A92-12202

POSSIBILITIES FOR IMPROVING THE CHARACTERISTICS OF A RADIATOR COOLER THROUGH THE USE OF FINNED HEAT PIPES AS RADIATING ELEMENTS [VOZMOZHNOSTI SOVERSHENSTVOVANIIA KHARAKTERISTIK KHOLODIL'NIKA-IZLUCHATELIA PUTEM ISPOL'ZOVANIIA V KACHESTVE SVETIASHCHIKH ELEMENTOV OREBRENNYKH TEPLOVYKH TRUB]

E. G. ZAULICHNYI (AN BSSR, Institut Iadernoi Energetiki, Minsk, Belorussian SSR) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0869-1339), July-Aug. 1991, p. 20-26. In Russian. Aug. 1991 7 p In RUSSIAN refs

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The problem of heat transfer by means of radiators with finned heat pipes is solved analytically in the 1D approximation. In comparison with the 2D solution, the solution presented here clearly illustrates ways of optimizing the mass and dimensional characteristics of such heat exchangers and demonstrates the advantages of finned heat pipes over regular finned radiators without heat pipes. An algorithm is proposed which can be used in the design of compact heat exchangers of a specified capacity with constraints on their weight and dimensions. V.L.

A92-12803

A METHOD FOR DETERMINING THE PARAMETERS OF MATHEMATICAL GENERALIZATIONS OF EXPERIMENTAL DATA ON CONVECTIVE HEAT TRANSFER [METODIKA OPREDELENIIA PARAMETROV MATEMATICHESKIKH OBOBSHCHENII EKSPERIMENTAL'NYKH DANNYKH PO KONVEKTIVNOMU TEPLOOBMENU]

P. G. KRUKOVSKII, A. A. KHALATOV, and L. V. SYSKOV (AN USSR, Institut Tekhnicheskoi Teplofiziki, Kiev, Ukrainian SSR) Promyshlennaia Teplotekhnika (ISSN 0204-3602), vol. 13, no. 3, 1991, p. 61-64. In Russian. 1991 4 p In RUSSIAN refs

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A method and an algorithm are proposed for determining an arbitrary number of the parameters of arbitrary nonlinear mathematical descriptions of experimental data on convective heat transfer. The method is demonstrated by solving a test problem and processing experimental data on convective heat transfer in the blade passages of a gas turbine engine. The approach proposed here has been implementd in software. V.L.

A92-12805
CALCULATION OF THE CROSS-SECTIONAL SHAPE OF A JET IN A CROSS FLOW [RASCHET FORMY POPERECHNOGO SECHENIIA STRUI V SNOSIASHCHEM BOKOVOM POTOKE]
E. V. BRUIATSKII and V. G. KUZ'MENKO (AN USSR, Institut Gidromekhaniki, Kiev, Ukrainian SSR) Gidromekhanika (ISSN 0367-4088), no. 63, 1991, p. 15-20. In Russian. 1991 6 p In RUSSIAN refs
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A vortex model of the evolution of the cross section of a jet flowing into a cross stream is examined. The jet is modeled by a system of discrete vortices which move along the jet-stream interface. A closed system of equations describing the vortex paths is obtained and solved numerically. The jet cross section calculations are found to be in good agreement with experimental data. V.L.

A92-12858
EXPERIMENTAL RESEARCHES ON FLUID PHYSICS IN MICROGRAVITY CONDITIONS
M. S. AGAFONOV, V. L. LEVTOV, L. V. LESKOV, and V. V. ROMANOV (NPO Kompozit, Kaliningrad, USSR) IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 3 p refs
Copyright
Experimental research in hydrodynamics carried out aboard the Salyut-6, Salyut-7, and Mir stations under microgravity conditions is reviewed. The role of vibrational factors in various processes is shown to be of importance and the conditions of dynamic microgravity are discussed. O.G.

A92-13739
EXPERIMENTAL VERIFICATION OF THE HYPOTHESIS CONCERNING THE ISOTROPY OF THE FINE-SCALE STRUCTURE OF TURBULENCE [EKSPERIMENTAL'NAIA PROVERKA GIPOTEZY OB IZOTROPII MELKOMASSHTABNOI STRUKTURY TURBULENTNOSTI]
M. IU. KARIAKIN, V. R. KUZNETSOV, and A. A. PRASKOVSKII Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), Sept.-Oct. 1991, p. 26-39. In Russian. Oct. 1991 14 p In RUSSIAN refs
Copyright
The hypothesis of the local isotropy of turbulence is examined in the light of the existing experimental data, and it is concluded that these data do not disprove this hypothesis in an unambiguous manner. Results of new wind tunnel experiments are then described which were aimed at achieving high Reynolds numbers, conducting highly localized measurements, and analyzing possible errors. It is found that the use of an X-shaped transducer involves a large number of sources of small errors, which are responsible for an increase in the anisotropy coefficients. For this reason, an unambiguous conclusion about the anisotropy of the local structure of turbulence cannot be made. V.L.

A92-13746
AN INITIAL VALUE PROBLEM FOR A HEAVY VISCOUS FLUID FLOWING DOWN AN INCLINED PLANE [OB ODNOI NACHAL'NOI ZADACHE DLIA TIAZHELOI VIAZKOI ZHIDKOSTI, STEKAIUSHCHEI PO NAKLONNOI PLOSKOSTI]
R. K. BAGBEKOV and E. D. TERENT'EV Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), Sept.-Oct. 1991, p. 90-98. In Russian. Oct. 1991 9 p In RUSSIAN refs
Copyright
The linear initial value problem of the time evolution of perturbations in flow of a heavy viscous fluid down an inclined plane is investigated analytically. It is shown that perturbations assume the form of a wave packet propagating down the inclined plane. The solution is obtained by using direct and inverse integral transforms. Perturbed pressure graphs are presented for large values of the characteristic time. V.L.

A92-15004
STRUCTURE OF SHOCK WAVES IN GASES AND SUSPENSIONS OF MATTER IN GAS [STRUKTURA UDARNYKH VOLN V GAZAKH I GAZOVZVESIAKH]
S. K. MATVEEV and G. V. KOCHERYZHENKOV (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR) IN: Dynamic processes in gases and solid bodies 1990 9 p In RUSSIAN refs
Copyright
The interaction of an ordered flow of suspended solid particles in gas incident on a body with a screening cloud of chaotically moving particles formed in front of the body is investigated analytically using differential equations of the dynamics of multiphase systems. A solution is obtained for the problem of the structure of a shock wave in hypersonic flow of a gas with solid spheres. The results are compared with the known results of the kinetic theory of gases. V.L.

A92-15030
LIMITING STATE OF A SURFACE UNDER THERMAL LOADING [PREDEL'NOE SOSTOIANIE POVERKHNOSTI PRI TERMICHESKOM VOZDEISTVII]
V. M. POLIAEV, A. N. GENBACH, and A. A. GENBACH (VIPKenergo, Alma-Ata, Kazakh SSR) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 29, Sept.-Oct. 1991, p. 923-934. In Russian. Oct. 1991 12 p In RUSSIAN refs
Copyright
An analysis is carried out to determine heat fluxes and thermal stresses produced in rocks and also in the metal walls of combustion chambers and nozzles by a high-temperature supersonic gas jet. It is shown that the fracture mechanism of metals is essentially different from that of rocks; some of their thermomechanical properties are also different. Nevertheless, based on a solution for the heat conductivity equation with boundary conditions of the second kind, an analogy is established between the behaviors of these materials, and expressions are obtained which make it possible to predict and prevent the limiting states of vapor-generating surfaces and to select optimal thermal loads for fracturing rocks. V.L.

A92-15032
FORMATION OF A CONTINUOUS GAS LAYER DURING THE OUTFLOW OF A GAS INTO A FLUID [OBRAZOVANIE SPLOSHNOGO GAZOVOGO SLOIA PRI ISTECHENII GAZA V ZHIDKOST']
A. A. DUSHKIN (Moskovskii Aviatsionnyi Institut, Moscow, USSR) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 29, Sept.-Oct. 1991, p. 988-994. In Russian. Oct. 1991 7 p In RUSSIAN refs
Copyright
The discrete-continuous flow transition during the injection of a gas into a moving liquid is investigated analytically. In particular, attention is given to dissipative processes during the formation of an interface in the liquid flow. To determine the onset of jet flow, the stationary flow conditions are used in accordance with the irreversible thermodynamics method. The transition from nucleate gas flow to jet flow is described by a system of nonlinear algebraic equations. The solution is presented in the form of a criterial dependence which is consistent with the known empirical relations. V.L.

A92-15493
LAGRANGIAN TURBULENCE AND ANOMALOUS TRANSPORT
G. M. ZASLAVSKII (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR) Fluid Dynamics Research (ISSN 0169-5983), vol. 8, Oct. 1991, p. 127-133. Oct. 1991 7 p refs
Copyright
The motion of a passive particle in a given velocity field can be considered from the viewpoint of dynamic systems theory. A two-dimensional time-dependent field and a three-dimensional field generate chaotic behavior of liquid particles. The diffusion process of liquid particles is considered as a random walk process in the fractal space and time. This leads to anomalous transport properties

the computation time can be reduced. The computation of the laminar compressible boundary layer is illustrated for the surface of an elliptical cone in a supersonic flow. The differences between the pseudo-Greenian FEM approach employed in the paper and traditional FEM calculations are examined. The pseudo-Greenian approach can be used to develop a set of projection methods including the least-squares and the collocation methods. C.C.S.

A92-24980
CONTROL OF LAMINAR BOUNDARY LAYER SEPARATION
A. V. DOVGAL' and V. V. KOZLOV (Academy of Sciences of the USSR, Institute of Theoretical and Applied Mechanics, Novosibirsk) Russian Journal of Theoretical and Applied Mechanics (ISSN 1051-8045), vol. 1, June 1991, p. 103-109. Jun. 1991 7 p refs
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Possibilities of controlling laminar boundary layer separation are discussed with particular attention given to the 'sensitivity' of separation regions to external periodic forcing. The formation of transitional separated flows is related to an associated laminar-turbulent transition, which in turn is governed by outflow disturbances. It is suggested that it is possible to operate transitional separated flows by means of flow adjustment and imposition of external disturbances even of small amplitudes. The NASA 63(420)-517 airfoil has been tested at Reynolds number 200,000 in the low turbulent wind tunnel to study the effect of suction on a transitional separation bubble occurring in an adverse pressure gradient region of the airfoil. Suction is found to result in filling of the velocity profile and suppressing the disturbances of laminar flow. O.G.

A92-27482
A VARIATIONAL METHOD FOR SOLVING THE PROBLEM OF MOTION OF A PROFILE OF COMPLEX GEOMETRY IN A FLUID [VARIATSIINII METOD ROZV'IAZANNIA ZADACHI PRO RUKH PROFILIA SKLADNOI GEOMETRICHNOI FORMI V RIDINI]
N. I. PARFENENKO (AN Ukrainy, Institut Gidromekhaniki, Kiev, Ukraine) Akademiia Nauk Ukrains'koi RSR, Dopovidi, Matematika, Prirodoznavstvo, Tekhnichni Nauki (ISSN 0868-8052), March 1991, p. 53-56. In Ukrainian. Mar. 1991 4 p In UKRAINIAN refs
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An approximate method is developed for determining the dynamic characteristics (attached masses and moments of inertia) of a plane body of arbitrary geometrical shape moving in an infinite ideal incompressible fluid. The approach is based on the application of inversion and a variational method to the corresponding boundary value problems formulated in transformed finite-dimensional regions. Results of numerical calculations are presented for the motion of bodies of specific geometry. V.L.

A92-27536
A NUMERICAL STUDY OF A RADIAL TURBULENT JET [CHISLENNOE ISSLEDOVANIE RADIAL'NOI TURBULENTNOI STRUI]
K. E. DZHAUGASHTIN and A. A. SHELEPOV (AN KSSR, Institut Matematiki i Mekhaniki, Alma-Ata, Kazakh SSR) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0869-1339), Nov.-Dec. 1991, p. 42-46. In Russian. Dec. 1991 5 p In RUSSIAN refs
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The characteristics of a radial turbulent jet of an incompressible fluid are calculated over the entire range of jet evolution using boundary layer equations for the mean velocity and kinetic energy of pulsating motion. The semiempirical computation scheme proposed here makes it possible to calculate the mean and pulse velocities using a minimum amount of empirical data. The calculation results are compared with experimental data. V.L.

A92-28374
SCREENING PROPERTIES OF PROTECTIVE WALL FILMS [EKRANUIUCHI VLASTIVOSTI PRISTINNIKH ZAKHISNIKH ZAVIS]
V. M. REPUKHOV, E. N. ZOTOV, A. I. NEDUZHKO, and A. N. SEMENOV (AN URSR, Institut Tekhnichnoi Teplofiziki, Kiev, Ukrainian SSR) Akademiia Nauk Ukrains'koi RSR, Dopovidi, Matematika, Prirodoznavstvo, Tekhnichni Nauki (ISSN 0868-8052), June 1991, p. 67-71. In Ukrainian. Jun. 1991 5 p In UKRAINIAN refs
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Experimental data are presented on the attenuation of radiant heat fluxes by films of a gas injected into the wall layer of subsonic air flow with a wide range of temperature variation (300-1000 K). A method for estimating the attenuation of radiant fluxes by screening films is proposed and validated. The attenuation is calculated for the mass absorption coefficient, flow rate of the attenuating component per flow width unit, and its mean velocity in the cross section of interest. V.L.

A92-29493
CONTROL VOLUME FINITE-ELEMENT METHOD FOR NAVIER-STOKES EQUATIONS IN VORTEX-STREAMFUNCTION FORMULATION
M. S. KRAKOV (Belorussian Polytechnic Institute, Minsk, Belarus) Numerical Heat Transfer, Part B: Fundamentals (ISSN 1040-7790), vol. 21, Mar.-Apr. 1992, p. 125-145. Apr. 1992 21 p refs
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The control volume-based finite-element method for solution of the Navier-Stokes equations in vortex-streamfunction formulation is presented. The exponential interpolation function suggested by Baliga and Patankar is used for the vortex, whereas the linear interpolation function refers to the streamfunction. The new feature of the method lies in the formulation of boundary conditions for the vortex on a solid surface. Author

A92-30147
GASDYNAMIC CALCULATION OF AN IMPULSE WIND TUNNEL WITH A TWO-SECTION PLENUM [GAZODINAMICHESKII RASCHET IMPUL'SNOI USTANOVKI S DVUKHSEKTSIONNOI FORKAMEROI]
V. A. ZHOKHOV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 2, 1990, p. 50-60. In Russian. 1990 11 p In RUSSIAN refs
Copyright

An approximate method is proposed for calculating the process taking place in an impulse wind tunnel with a two-section plenum. A comparative analysis is made of the approximate and exact solutions to the system of equations describing the wind tunnel process. Possible applications of the approach proposed here are discussed. V.L.

A92-30161
INVESTIGATING THE FEASIBILITY OF CONTROLLING THE LAMINAR-TURBULENT TRANSITION BY MEANS OF LAMINARIZING PLATES [ISSLEDOVANIE VOZMOZHNOSTI UPRAVLENIIA LAMINARNO-TURBULENTNYM PEREKHODOM S POMOSHCH'IU LAMINARIZIRUIUSHCHIKH PLASTIN]
I. A. BELOV and V. M. LITVINOV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 3, 1990, p. 39-46. In Russian. 1990 8 p In RUSSIAN refs
Copyright

The effect of installing plane-parallel laminarizing plates into the laminar boundary layer on the development of artificially induced vortex disturbances and on the position of the laminar-turbulent transition was investigated in experiments performed in a subsonic 1.2-m-diam tunnel. The laminarizing plate was a 1000 x 500 x 20 mm flat metal plate with an ellipsoidal frontal edge. It was found that the introduction of the plate resulted in damping of the near-wall velocity fluctuations and, under certain conditions, in a downstream displacement of the laminar-turbulent transition. I.S.

A92-30183
AN INVESTIGATION OF THE FLOW STRUCTURE AND GASDYNAMIC CHARACTERISTICS OF AERODYNAMIC WINDOWS WITH FREE VORTICES [ISSLEDOVANIE STRUKTURY POTOKA I GAZODINAMICHESKIKH KHARAKTERISTIK AERODINAMICHESKIKH OKON SO SVOBODNYM VIKHREM]
A. A. GILERSON, V. I. PANCHENKO, V. G. RAFIKOV, R. I. SERIKOV, and V. M. KHAILOV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 4, 1990, p. 104-108. In Russian. 1990 5 p In RUSSIAN refs
Copyright

The gasdynamic characteristics of aerodynamic windows with free vortices are calculated for average pressure ratios from 1.5 to 15. Methods for increasing and controlling the pressure ratios on the window and for choosing the optimal geometries of the nozzle and the diffusor are described. In addition, the calculation of the mixture layers on the boundaries of submerged curvilinear jets is discussed. I.S.

A92-30189
GAS THERMODYNAMICS OF A TWO-PHASE JET INCIDENT ON A NORMAL OBSTACLE [GAZOTERMODINAMIKA DVUKHFAZNOI STRUI, NATEKAIUSHCHEI NA NORMAL'NUIU PREGRADU]
G. V. MOLLESON and A. L. STASENKO TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 5, 1990, p. 51-58. In Russian. 1990 8 p In RUSSIAN refs
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The axisymmetric problem of flow of a two-phase mixture in a Laval nozzle and in a supersonic submerged jet incident on a normal obstacle is solved numerically for large initial flow rates of the disperse phase (comparable with that of the carrier gas). The effect of the principal parameters (flow rate and size of the particles and the distance between the nozzle exit section and the obstacle) on the compressed layer thickness, the size of the recirculation zone in stationary flow, and characteristics of the self-oscillatory regimes of jet-obstacle interaction is investigated. V.L.

A92-30335
EFFICIENCY OF A COOLING FILM ON A CURVED SURFACE [EFFEKTIVNOST' TEPLOVOI ZAVESY NA KRIVOLINEINOI POVERKHNOSTI]
V. M. REPUKHOV and T. N. GORISLAVETS (AN Ukrainy, Institut Tekhnicheskoi Teplofiziki, Kiev, Ukraine) Promyshlennaia Teplotekhnika (ISSN 0204-3602), vol. 13, no. 4, 1991, p. 47-51. In Russian. 1991 5 p In RUSSIAN refs
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Results of a numerical study of the combined effect of the pressure gradient and surface curvature of supersonic nozzles on the efficiency of a cooling film are reported for the case of a substantial difference between the main and injected flow temperatures. An empirical expression is proposed in the form of a correction allowing for the effect of surface curvature on the cooling film efficiency. The calculated curves are compared with experimental data in the literature. V.L.

A92-30380
DEVELOPMENT OF THE ASYMPTOTIC THEORY OF A TURBULENT BOUNDARY LAYER [RAZVITIE ASIMPTOTICHESKOI TEORII TURBULENTNOGO POGRANICHNOGO SLOIA]
V. M. EPIFANOV, A. V. PASHUTOV, and A. N. STREL'CHENKO Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriia Mashinostroenie (ISSN 0236-3941), Oct.-Dec. 1990, p. 80-84. In Russian. Dec. 1990 5 p In RUSSIAN refs
Copyright

Using the method of Van Dyke asymptotic expansions, a new expression is obtained for the relative friction law as a function of four disturbing factors, compressibility, nonisothermicity, injection, and pressure gradient, making it possible to exclude the use of the superposition principle. Four particular cases of the application of these expressions are analyzed, and theoretical velocity profiles are compared with those obtained in an experimental study of gradient flow on a nonisothermal porous surface. L.M.

A92-31452
THE THERMAL BAR
S. S. ZILITINKEVICH, K. D. KREIMAN, and A. IU. TEZHEVIK (Russian Academy of Sciences, Institute of Limnology, St. Petersburg, Russia) Journal of Fluid Mechanics (ISSN 0022-1120), vol. 236, March 1992, p. 27-42. Mar. 1992 16 p refs
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A simple theoretical model of the thermal bar is derived on the basis of heat budget equations for the following three zones of a wedge-shaped water basin warmed from above: (1) stably stratified shallow warm-water zone; (2) vicinity of the bar; and (3) convectively mixed deep cold zone. In contrast to the traditional approach, advective warming of the vicinity of the bar and associated facilitating of the thermal bar propagation are taken into account. Theoretical predictions are compared with the data of lacustrine and laboratory measurements taken from current literature. New laboratory experiments have been carried out to examine the laminar regime of the thermal bar. Author

A92-31470
TWO-DIMENSIONAL VORTEX-DIPOLE INTERACTIONS IN A STRATIFIED FLUID
S. I. VOROPAEV and IA. D. AFANAS'EV (AN SSSR, Institut Okeanologii, Moscow, USSR) Journal of Fluid Mechanics (ISSN 0022-1120), vol. 236, March 1992, p. 665-689. Mar. 1992 25 p refs
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Planar motion produced when a viscous fluid is forced from an initial state of rest is studied. Considered are a vortex dipole produced by the action of a point force (Cantwell, 1986), and a vortex quadrupole produced by the action of two equal forces of opposite direction. Also presented are the results from an experimental investigation into the dynamics of the interactions between vortex dipoles as well as between vortex dipoles and a vertical wall in a stratified fluid. Theoretical consideration reveals that the dynamics of two-dimensional vortex-dipole interactions are determined by two main governing parameters: the dipolar intensity of the vorticity distribution (momentum) and the quadrupolar intensity of the vorticity distribution of the flow. Details of different basic types of interactions are documented, and a physical interpretation of the results obtained in terms of vortex multipoles is presented: dipoles, quadrupoles, and their combination. Author

A92-31486
CFD STATE-OF-THE-ART IN THE U.S.S.R
O. M. BELOTSERKOVSKII (Russian Academy of Sciences, Institute of Computer Aided Design, Moscow, Russia) (International Association for Computational Mechanics, World Congress of Computational Mechanics, 2nd, Stuttgart, Federal Republic of Germany, Aug. 27-31, 1990) International Journal for Numerical Methods in Engineering (ISSN 0029-5981), vol. 34, March 30, 1992, p. 395-415. 30 Mar. 1992 21 p refs
Copyright

Numerical methods for modern problems of CFD are described. Steady and unsteady aerodynamic flows, different turbulent regimes, and motion around complex-shape bodies (aircraft as a whole) are investigated. These approaches sharply reduce the level of demand on computer sources. P.D.

A92-31490
NUMERICAL SIMULATION OF THE SEPARATED FLUID FLOWS AT LARGE REYNOLDS NUMBERS
V. A. GUSHCHIN and V. N. KONSHIN (Russian Academy of Sciences, Institute of the Computer Aided Design, Moscow, Russia) (International Association for Computational Mechanics, World Congress of Computational Mechanics, 2nd, Stuttgart, Federal Republic of Germany, Aug. 27-31, 1990) International

A92-46576
SUBSTANTIATION OF THE LINEARIZATION METHOD IN A PROBLEM OF FLOW AROUND BODIES [OBOSNOVANIE METODA LINEARIZATSII V ZADACHE OBTEKANIIA]
L. I. SAZONOV (Rostovskii Gosudarstvennyi Universitet, Rostov-on-Don, Russia) Rossiiskaia Akademiia Nauk, Doklady (ISSN 0002-3264), vol. 323, no. 1, 1992, p. 48-51. In Russian. 1992 4 p In RUSSIAN refs
Copyright
The present study substantiates the application of the linearization method to the problem of the stability of the steady flow around a bounded body in R-cubed space. The approach is based on a theorem concerning the stability of the null solution of an abstract differential equation in Banach space, which is analogous to a result obtained by Iudovich (1984). L.M.

A92-47154
COMPUTATIONAL ASPECTS OF THE SPLITTING METHOD FOR INCOMPRESSIBLE FLOW WITH A FREE SURFACE
V. A. GUSHCHIN and V. N. KONSHIN (Russian Academy of Sciences, Institute of Computer Aided Design, Moscow, Russia) (Japan - Soviet Union Joint Symposium on Computational Fluid Dynamics, 2nd, Tsukuba, Japan, Aug. 27-31, 1990) Computers & Fluids (ISSN 0045-7930), vol. 21, no. 3, July 1992, p. 345-353. Jul. 1992 9 p refs
Copyright
The paper proposes an efficient method for obtaining highly accurate solutions in the vicinity of a free surface or in domains where large gradients in the hydrodynamic flow parameters exist. The proposed method has been used to investigate both the steady and unsteady wave motions of a liquid. The proposed approach makes possible a substantial reduction of the computer time needed to calculate a single time layer. This is a result of the application of a hybrid finite difference scheme for the convective terms in the equations of motions and the development of an efficient algorithm for solving the elliptic problem. L.M.

A92-48722#
THE FLOW PATTERN AND EXTERNAL HEAT TRANSFER INVESTIGATION FOR GAS TURBINE VANES END SURFACES
V. A. GORELOV, V. A. MALKOV, and A. A. KHALATOV (Lyulka Engine Design Bureau, Moscow, Russia) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 28th, Nashville, TN, July 6-8, 1992. 4 p. Jul. 1992 4 p
(AIAA PAPER 92-3071) Copyright
Experimental investigation results of the flow pattern and heat transfer on the end surface of an curvilinear converging channel are presented in this paper. Geometry of the models used for this investigation, was characteristic of the turbine first stage vanes. Velocity profiles measurements of main and cross flowing streams with and without air blowing-out for end-surfaces film cooling have been made. The investigation of local heat transfer on the end surface different areas have been carried out. Some investigation results of the vanes-end-surface film cooling effectiveness in air supplying through annular slot, located upstream of the vanes leading edges, are presented. Author

A92-49193
A MATHEMATICAL EXPERIMENT AIMED AT THE STUDY OF HEAT AND MASS TRANSFER IN THE EVAPORATION ZONE OF HEAT PIPES [MATEMATICHESKII EKSPERIMENT PO ISSLEDOVANIIU TEPLOMASSOPERENOSA V ZONE ISPARENIIA TEPLOVYKH TRUB]
A. S. DEMIDOV and E. S. IATSENKO (VNITs VEI; Moskovskii Gosudarstvennyi Universitet, Moscow, Russia) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 30, no. 3, May-June 1992, p. 566-572. In Russian. Jun. 1992 7 p In RUSSIAN refs
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The stationary two-dimensional boundary value problem with a free boundary describing a phase transition inside a capillary structure is investigated numerically. The shape and position of the boundary are determined by using thermodynamic parameters at the saturation line. A solution is obtained by the grid method using a modified version of the Richardson scheme. The results are presented in the form of isotherms and mass flow lines. The model proposed here makes it possible to examine the individual phases of the process, trace the nucleation and growth of vapor bubbles, determine evaporation intensity distribution inside the capillary structure, and determine the critical conditions of evaporator operation. V.L.

A92-49194
METHODS AND MEANS OF HEAT TRANSFER MODELING FOR HIGH-VELOCITY HETEROGENEOUS FLOWS [METODY I SREDSTVA MODELIROVANIIA TEPLOOBMENA V VYSOKOSKOROSTNYKH GETEROGENNYKH POTOKAKH]
D. S. MIKHATULIN, IU. V. POLEZHAEV, and I. V. REPIN (Rossiiskaia Akademiia Nauk, Institut Vysokikh Temperatur, Moscow, Russia) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 30, no. 3, May-June 1992, p. 573-579. In Russian. Jun. 1992 7 p In RUSSIAN refs
Copyright
The paper is concerned with the possibility of using a gasdynamic wind tunnel to generate high-temperature supersonic heterogeneous flows (gas-solid particles) for modeling the thermal interaction between a heterogeneous medium and a body surface. The velocity and temperature inhomogeneities of the phases are analyzed. The experimental method and simulation of the thermal and dynamic loading of the models are discussed. V.L.

A92-49228
PRESSURE DISTRIBUTION ON THE SURFACE OF A ROTATING CYLINDER IN TRANSVERSE FLOW AND SIGN REVERSAL OF THE MAGNUS FORCE [RASPREDELENIE DAVLENIIA PO POVERKHNOSTI VRASHCHAIUSHCHEGOSIA TSILINDRA V POPERECHNOM POTOKE I IZMENENIE ZNAKA POD'EMNOI SILY MAGNUSA]
V. P. KOZLOV Moskovskii Universitet, Vestnik, Seriia 1 - Matematika, Mekhanika (ISSN 0579-9368), no. 2, Mar.-Apr. 1992, p. 100-103. In Russian. Apr. 1992 4 p In RUSSIAN refs
Copyright

A92-52718
FRONT STRUCTURE AND EFFECTS OF THE TRANSLATIONAL NONEQUILIBRIUM IN SHOCK WAVES IN A GAS MIXTURE
A. P. GENICH, S. V. KULIKOV, G. B. MANELIS, and S. L. CHERESHNEV (Russian Academy of Sciences, Institute of Chemical Physics, Chernogolovka, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 8 p refs
Copyright
The simulation Monte Carlo method based on the synthesis of ideas of Bird and Belotserkovskii, Yanitskii (B-Y) has been used to calculate the internal structure of normal shock waves in gas mixtures. Results are obtained for the molecular velocity distributions at various locations in the shock. Particular attention is paid to the overshoot in the relative velocity distribution and in the heavy gas temperature. The effects of number density ratio, mass ratio and shock Mach number on the overshoot are studied. The nonequilibrium effects in shock wave are shown by the observation of superequilibrium emission of CS2 mixture with noble gases in shock tube. The experimental data are interpreted by means of the obtained calculated results. The effects depend on the shock strength, the mixture composition and the sort of diluent. Author

A92-52719
SHOCK-WAVE STRUCTURE IN A TERNARY DISPARATE-MASS GAS MIXTURE
G. A. RUEV, V. M. FOMIN, and M. SH. SHAVALIEV (Russian Academy of Sciences, Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen,

Germany, July 8-14, 1990 1991 8 p refs
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Navier-Stokes level equations of three-fluid hydrodynamics are presented for ternary gas mixture consisting of heavy molecules of two species with near masses and light molecules. It is shown that in flows of such mixtures there may arise the large relative diffusion velocity and temperature-difference between heavy species due to the influence of light gas. The equations are applied to study the shock-wave structure in mixture under consideration. The profiles of species velocities and temperatures are presented for Mach numbers from 2 to 4 and different values of mixture parameters. They indicate at the presence of strong velocity- and temperature-separation between all components of mixture and confirm the above effect. The heavy gases temperatures overshoot is obtained and the influence of molecular mass-ratio and cross section-ratio on it is examined. Author

A92-52720
TURBULENCE IN RAREFIED GASES
S. A. NOVOPASHIN and A. L. PEREPELKIN (Russian Academy of Sciences, Institute of Thermophysics, Novosibirsk, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 7 p refs
Copyright

The existence of turbulent scales in the order of 50 molecule free pass length (MFPL) at the transition to turbulence at the supersonic jet boundary was experimentally obtained. The similarity of gasdynamic parameters has not been observed at the outflowing from the geometrically similar nozzles, at the same Mach number, same Knudsen number, and same pressure ratio. The additional similarity parameter is the nozzle edge roughness which defines the transition to turbulence scenario. Spatial-temporal correlation function over the Reynolds number range 500-20,000 was measured for two types of scenarios. The influence of the thermodynamic fluctuation on laminar-turbulent transition has not been found. Author

A92-52731
NUMERICAL STUDY OF THE INTERNAL STRUCTURE OF RAREFIED JETS
F. G. CHEREMISIN (Russian Academy of Sciences, Computing Center, Moscow, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 6 p
Copyright

Undisturbed plane jets expiring into vacuum or interacting with the cold cryogenic plate situated normally to the stream direction are considered. These two types of the flow are studied by the numerical method based on the direct solving of the Boltzmann equation. The comparative analysis of flows makes it possible to estimate the role of the intermolecular scatterings as well as to determine the influence of a small portion of the ambient or reflected from a wall gas on the main stream. Author

A92-52758
FREE MOLECULE GAS FLOWS IN ANNULUS CHANNELS
ZINAIDA I. SHARAPOVA (Ural State University, Yekaterinburg, Russia) and VALERII V. KALININ (Engineering Pedagogical Institute, Yekaterinburg, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 9 p refs
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A theoretical treatment is presented of the Knudsen gas flow in the spacing between two coaxial cylinders with random-chosen geometrical sizes of the duct. The results obtained include a case of gas flowing through two coaxial cylinders (an outer and an inner cylinder) with different physical properties. Namely, the surface of the outer cylinder is slightly radiating and also slightly absorbind, while the surface of the inner cylinder fails to radiate, but absorbs the molecules falling thereon. I.S.

A92-52759
MAXIMUM VALUE OF MASS GAS FLOWS THROUGH AN ORIFICE
V. N. GUSEV and E. V. KHMEL'NITSKAIA (Central Aero-Hydrodynamics Institute, Moscow, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 6 p refs
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The paper investigates the cause of an increase of the gas-flow rate, as compared to a limit inviscid value, when gas is passing through an orifice at low Reynolds numbers, as was shown in experiments described by Liepmann (1961). The analysis, considers viscous and heat-conducting gas flows for a case of a spherical sink, which is described by a system of modified one-dimensional Navier-Stokes equations. It is shown that the solution of the sink could be obtained only as a certain class of solutions. I.S.

A92-52779
WEIGHTING SCHEMES FOR MONTE CARLO SIMULATION AND THEIR APPLICATIONS TO THE CALCULATION OF SHOCK WAVES IN MULTICOMPONENT AND REACTIVE GASES
V. V. SERIKOV (Russian Academy of Sciences, Institute of Computer Aided Design, Moscow, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 8 p refs
Copyright

New weighting schemes of the statistical particle-in-cell method for modeling neutral and reactive multicomponent gas flows are under consideration. A ballot-box modification of the collision simulation algorithm is taken as the basis. This approach makes it possible to carry out calculations in the case of large differences of the component concentrations. As an example, the results for the shock wave structure at Mach 3.89 in a binary gas mixture of 97 percent He - 3 percent Xe are considered. Also presented are the results of numerical simulation of the shock waves at Mach numbers 5 and 10 in four-component reactive mixtures of gases varying greatly by concentrations and molecular masses. Author

A92-52796
RAREFACTION EFFECT ON NON-STATIONARY INTERACTION OF SUPERSONIC UNDEREXPANDED JETS WITH THE NORMAL INFINITE FLAT PLATE
V. S. FAVORSKII, A. V. SAVIN, I. V. SHATALOV, and E. I. SOKOLOV (St. Petersburg Mechanical Institute, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 8 p refs
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An experimental study concerned with nonstationary supersonic jet/plate interaction is described. Three different nonstationary flow regimes were observed. In the course of experiments the dependence of oscillation phases, amplitudes, and frequencies on initial parameters was proved. Approximations for oscillation frequency were obtained. The effect of rarefaction on the nonstationary regime boundaries was investigated. The minimal Reynolds numbers permitting the existence of nonstationary regimes and their dependence on basic flow parameters were obtained. Author

A92-52802
SUPERSONIC JET SURFACE INTERACTION IN FREE-MOLECULAR AND TRANSITIONAL FLOW MODES
E. I. SOKOLOV, V. P. SUSLOV, and F. B. BYKOV (St. Petersburg, Mechanical Institute, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 8 p refs
Copyright

The results of theoretical studies and approximate methods for the calculation of flows originating in the process of free jet expansion and its impingement on arbitrary surface are presented for free-molecular and transitional flow regimes. The essence of the developed methods consists of analytical solutions for

peripheral and near-axis jet regions. They give a base for an effective computational procedure taking into account some important effects in free jet. The local hypothesis is used for developing a method for calculating stresses on surface in oncoming jet flow. The method includes the determination of rarefaction criteria using dimensions of subsonic flow zone near infinite surface in a jet. The results of calculations are compared with experimental data. Author

A92-52812
STRONG SUBSONIC AND SUPERSONIC CONDENSATION ON A PLANE SURFACE
A. P. KRIUKOV (Moscow Power Engineering Institute, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 7 p refs
Copyright
The aim of this paper is to present the results of investigation of strong condensation process. As subsonic as well as supersonic condensation is analyzed on the basis of the Boltzmann equation. This equation is solved by the moment method. The distribution function is assumed as two-stream Maxwellian; thus, this function contains six unknown parameters. The solutions results are represented in three-dimensional space (M-infinity, T-infinity, eta-infinity). Data obtained by other authors are compared. In the concluding part, a comparison of the solutions results with the experimental data of strong condensation of mercury and potassium is presented. Author

A92-52819
MASS TRANSFER NEAR SHIELDED SURFACES OF A SPACECRAFT IN A HIGHLY RAREFIED GAS
IU. A. NIKITCHENKO and S. B. SVIRCHEVSKII (Moscow Aviation Institute, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 7 p refs
Copyright
A mathematical model of the mass transfer, describing the processes of interference and scattering of gas flows in an interdependent manner, is elaborated. The approximation of the theory of first collisions is used for mass transfer explanation. An algorithm for calculation by the BGK-model is synthesized. Calculations of geometric structures in the form of parallelepiped with different number of sides are made by both models. On the base of the calculations, the scope of the first collisions model was estimated. Author

A92-53051
THE ORIGIN OF ORGANIZED MOTION IN TURBULENCE
A. V. TUR (Russian Academy of Sciences, Space Research Institute, Moscow, Russia; Ormat Industries, Ltd., Yavne, Israel; CNRS, Laboratoire d'Energetique et de Mecanique Theorique et Appliquee, Vandoeuvre-les-Nancy, France) and E. LEVICH (Ormat Industries, Ltd., Yavne, Israel) Fluid Dynamics Research (ISSN 0169-5983), vol. 10, no. 2, Aug. 1992, p. 75-90. Aug. 1992 16 p refs
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Theories of turbulence or modeling schemes based on closures, or more generally on the assumption of weak interaction between velocity harmonics which are phase-independent and insensitive to such perturbation, do not account for coherence and intermittency and are necessarily and fundamentally insufficient to describe this phenomenon. The destruction of small-scale coherence leads to an anomalous accumulation of helicity and, in anisotropic turbulent flow, generation of large-scale coherent vortices. It is argued here that this mechanism is responsible for violent atmospheric phenomena such as tropical hurricanes. This theory is shown to be in satisfactory agreement with numerical simulations. C.D.

A92-53571
HEAT EXCHANGE OF THE VIBRATING HEAT SOURCE WITHIN THE LIQUID CAPACITY
V. F. PRISNIAKOV (Dnepropetrovskii Gosudarstvennyi Universitet, Dnepropetrovsk, Ukraine), IU. V. NAVRUZOV (Akademiia Nauk Ukrainy, Institut Geotekhnicheskoi Mekhaniki, Dnepropetrovsk, Ukraine), P. V. MAMONTOV, V. N. SEREBRIANSKII (Dnepropetrovskii Gosudarstvennyi Universitet, Dnepropetrovsk, Ukraine), and A. V. STOICHEV IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 1 1990 7 p refs
Copyright
Results of an experimental study of the mechanisms of heat exchange between a vibrating heat source and a free surrounding liquid are reported. It is found that heater vibration significantly intensifies the convective heat exchange. It is also shown that vibration effects can produce substantial changes in the mechanism of steam bubble evolution both during their growth on the surface and on their detachment from the surface. V.L.

A92-53756
THE INFLUENCE OF HEAT GENERATION IN A DROPLET ON THERMOCAPILLARY FORCE
IU. S. RIAZANTSEV and A. E. REDNIKOV (Russian Academy of Sciences, Institute for Problems in Mechanics, Moscow, Russia) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2 1990 6 p refs
Copyright
The present consideration of the thermocapillary effects accompanying the motion of a droplet with internal heat sources or sinks, under gravity and under an external pressure gradient, gives attention to droplet-droplet and droplet-wall interactions due to internal release of heat. Results are presented for the cases of small Reynolds and Peclet numbers. Droplet motions within the range of velocities typical of thermocapillary interaction are shown to be both stable and unstable. O.C.

A92-54029#
THE ENHANCEMENT OF THE MIXING AND COMBUSTION PROCESSES IN SUPERSONIC FLOW APPLIED TO SCRAMJET ENGINE
V. I. KOPCHENOV and K. E. LOMKOV (Tsentral'nyi NII Aviatsionnogo Motorostroeniia, Moscow, Russia) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 28th, Nashville, TN, July 6-8, 1992. 9 p. Jul. 1992 9 p refs
(AIAA PAPER 92-3428) Copyright
The Reynolds averaged parabolized Navier-Stokes equations are employed for the numerical study of turbulent mixing and combustion of a supersonic hydrogen jet in a supersonic airflow. A one-equation differential turbulence model is utilized. The simplified flame sheet model is employed for the numerical simulation of the supersonic combustion. R.E.P.

A92-57109
PROCESSES OF AN UNSTEADY CONVECTIVE HEAT TRANSFER IN THE CHANNELS AND TANKS OF THE ENGINES AND POWER INSTALLATIONS OF THE SPACECRAFTS
GENRIKH A. DREITSER (Moscow Aviation Institute, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 11 p. Aug. 1992 11 p refs
(IAF PAPER 92-0674) Copyright
An analysis and generalization are presented of experimental data on the unsteady heat transfer of gases and liquids flowing in tubes under the conditions of heating, cooling, and variation in the flow rate, heat release in the tube walls, and entrance flow temperature. Comparison of analytical and experimental data made it possible to determine the tube radius distribution of turbulent flow parameters and to specify the effect of an unsteady flow structure on heat transfer. Different results for the unsteady impact on turbulent flow characteristics with experimental ones are also compared. Data on unsteady heat transfer in closed filled and emptied vessels are generalized. Generalizing relations are derived in order to calculate the unsteady heat transfer coefficient.

Engineering methods are proposed for predicting real unsteady thermal processes. P.D.

A92-57290
SELF-SUSTAINED MOTION OF A DROP IN HOMOGENEOUS SURROUNDINGS
IU. S. RIAZANTSEV and A. E. REDNIKOV (Russian Academy of Sciences, Institute of Problems of Mechanics, Moscow, Russia; Escuela Tecnica Superior de Ingenieros Aeronauticos, Madrid, Spain) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 7 p. Aug. 1992 7 p refs (IAF PAPER 92-0911) Copyright

The specific properties of the self-sustained thermocapillary drop motion are classified and analyzed. Analysis is based on the approximate analytical solution of Navier-Stokes, heat transfer, and mass transfer equations. The problem of multiplicity and stability of the regimes of the drop motion is discussed. The dependence of the motion on the level of microgravity is also considered. It is shown that a nonisothermal chemical reaction on the drop surface can cause rather unusual drop behavior. During drop motion, the thrust instead of the drag can emerge and, as a result, the drop can move against a mass force. In the absence of gravity and other external forces, and in homogeneous surroundings, the drop can move at nonzeroth velocity. P.D.

A92-57500
EXACT SOLUTION OF NAVIER-STOKES EQUATIONS DESCRIBING VORTEX STRUCTURE EVOLUTION IN GENERALIZED SHEAR FLOW [TOCHNOE RESHENIE URAVNENII NAV'E-STOKSA, OPISYVAIUSHCHEE EVOLIUTSIIU VIKHREVOI STRUKTURY V OBOBSHCHENNOM SDVIGOVOM TECHENII]
M. A. BRUTIAN and P. L. KRAPIVSKII Zhurnal Vychislitel'noi Matematiki i Matematicheskoi Fiziki (ISSN 0044-4669), vol. 32, no. 2, Feb. 1992, p. 326-329. In Russian. Feb. 1992 4 p In RUSSIAN refs
Copyright

A recursive method is proposed for obtaining exact solutions for nonstationary Navier-Stokes equations in the problem of the evolution of a longitudinal vortex structure in generalized shear flow of a viscous incompressible fluid. In the case where generalized shear flow is described by a polynomial of low degree the calculations can be performed in explicit form. V.L.

N92-11324# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Obninsk (USSR). Fiziko-Ehnergeticheskij Inst.
HEAT TRANSFER IN CHANNELS WITH UNIFORMLY SWIRLED FLOW
S. G. KALYAKIN and A. N. YARKIN 1989 9 p In RUSSIAN (DE91-635594; FEI-2017) Avail: CASI HC A02/MF A01

Equations for calculation of the heat transfer coefficient in uniformly swirled flows in the range of P(sub r) number change from 1 to 100 and from 0.004 to 0.04 are obtained on the basis of semiempirical models of turbulent flow. The principle possibility for increasing this range is shown. DOE

N92-13962*# Khmelnitsky Technological Inst. (USSR).
IDENTIFICATION OF DYNAMIC CHARACTERISTICS OF FLEXIBLE ROTORS AS DYNAMIC INVERSE PROBLEM
W. P. ROISMAN and L. D. VAJINGORTIN *In* Pennsylvania State Univ., Third International Conference on Inverse Design Concepts and Optimization in Engineering Sciences (ICIDES-3) p 457-468 1991
Avail: CASI HC A03/MF A06

The problem of dynamic and balancing of flexible rotors were considered, which were set and solved as the problem of the identification of flexible rotor systems, which is the same as the inverse problem of the oscillation theory dealing with the task of the identifying the outside influences and system parameters on the basis of the known laws of motion. This approach to the problem allows the disclosure the picture of disbalances throughout the rotor-under-test (which traditional methods of flexible rotor balancing, based on natural oscillations, could not provide), and identify dynamic characteristics of the system, which correspond to a selected mathematical model. Eventually, various methods of balancing were developed depending on the special features of the machines as to their design, technology, and operation specifications. Also, theoretical and practical methods are given for the flexible rotor balancing at far from critical rotation frequencies, which does not necessarily require the knowledge forms of oscillation, dissipation, and elasticity and inertia characteristics, and to use testing masses. Author

N92-13967*# Moscow Inst. of Aviation Technology (USSR). Dept. of Space System Engineering and Design.
INVERSE PROBLEMS AND OPTIMAL EXPERIMENT DESIGN IN UNSTEADY HEAT TRANSFER PROCESSES IDENTIFICATION
EUGENE A. ARTYUKHIN *In* Pennsylvania State Univ., Third International Conference on Inverse Design Concepts and Optimization in Engineering Sciences (ICIDES-3) p 513-530 1991
Avail: CASI HC A03/MF A06

Experimental-computational methods for estimating characteristics of unsteady heat transfer processes are analyzed. The methods are based on the principles of distributed parameter system identification. The theoretical basis of such methods is the numerical solution of nonlinear ill-posed inverse heat transfer problems and optimal experiment design problems. Numerical techniques for solving problems are briefly reviewed. The results of the practical application of identification methods are demonstrated when estimating effective thermophysical characteristics of composite materials and thermal contact resistance in two-layer systems. Author

N92-25836# Academy of Sciences (USSR), Svierdlovsk. Inst. of Thermal Physics.
CAPILLARY-PUMP LOOP FOR THE SYSTEMS OF THERMAL REGULATION OF SPACECRAFT
Y. F. MAIDANIK, Y. G. FERSHTATER, and K. A. GONCHAROV *In* ESA, 4th European Symposium on Space Environmental Control Systems, Volume 1 p 87-92 Dec. 1991 Prepared in cooperation with Lavochkin Association, Khimky, USSR
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

Capillary Pump Loops (CPL) are regarded as long term heat transfer devices for systems of thermoregulation of space vehicles. The use of high pressure capillary pumps ensuring pressures up to 50 kPa on low temperature heat transfer media makes it possible to create compact CPL with a high heat transfer capacity, which by their mounting characteristics approach electric cables. This is confirmed by the results of terrestrial tests of a prototype of CPL and also by flight tests of CPL aboard the space vehicle 'Granat'. ESA

N92-26972# Kiev Polytechnic (USSR).
PASSIVE THERMOSTATE SYSTEM WITH APPLICATION OF GAS-FILLED HEAT PIPES AND THERMAL ENERGY OF SOLAR RADIATION
V. M. BATURKIN, N. K. GRETCHINA, O. P. MOSKALENKO, and K. N. SHKODA *In* ESA, 4th European Symposium on Space Environmental Control Systems, Volume 2 p 769-774 Dec. 1991
Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

An approach to creating passive or half passive thermocontrol systems, using heat energy of solar radiation for functioning and variable conductance heat pipes as temperature control elements, is analyzed with conditions of considerably altering (more than 2 times) solar constant conditions. Results of calculation of control system specimens with two parallel metal fibrous methanol heat pipes are presented for the typical instrument unsealed module with conditions: range of solar constant values 500 to 1400 W/cu m; variations of the temperature on mount places 253 to 323 K; and device temperature level 280 to 300 K. ESA

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INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

A92-10862
AUTOWAVE HOLOGRAPHY [AVTOVOLNOVAIA GOLOGRAFIIA]
IU. I. BALKAREI and M. I. ELINSON (AN SSSR, Institut Radiotekhniki i Elektroniki, Moscow, USSR) Pis'ma v Zhurnal Tekhnicheskoi Fiziki (ISSN 0320-0116), vol. 17, July 12, 1991, p. 73-75. In Russian. 12 Jul. 1991 3 p In RUSSIAN refs
Copyright

The paper is concerned with the possibility of the holographic utilization of autowaves and autostructures (autosolitons) existing in nonlinear active media, such as chemical reactions, neuron networks, and continuum and discrete solid state systems. In particular, the possible use of stable collective excitations in the form of solitary traveling pulses and stationary solitary strata in such systems for implementing an analog of holography is examined. V.L.

A92-12904
EQUIPMENT SET 'BIRYUZA' AND 'ANALIZ' FOR ZERO-GRAVITY STATE STUDY
W. KH. GATAULLIN, SH. A. VAKHIDOV, V. I. SMYSHLIAEV, and N. V. ALEKSEENKO IN: AIAA/IKI Microgravity Science Symposium, 1st, Moscow, USSR, May 13-17, 1991, Proceedings 1991 2 p refs
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The equipment designed for investigating heat-mass exchange in microgravitational environments is described with attention given to results of specific experiments. The TB01 equipment is basically composed of a universal thermostat (Biryuza) and an automatic measuring device for electric currents (Analiz). The Biryuza provides the environment for investigating physical and chemical processes in solutions, gels, etc., and the Analiz can make direct measurements during the course of the space flight. Experiments conducted with the TB01 include temperature control and apparatus calibration as well as the study of chemical reactions in a zero-gravity environment. The TB01 is presently being revised by introducing a microcalculator and a disk-memory system into the device and providing compatibility with a common class of computers. C.C.S.

A92-20771
HOLOGRAPHIC-INTERFEROMETRY METHODS EMPLOYED FOR VIBRATION-STRENGTH TESTING OF AVIATION-ENGINE WORKPIECES
D. S. ELENEVSKII, N. I. KRAINIUKOV, IU. N. SHAPOSHNIKOV, and A. G. KHRAMOV (AN SSSR, Tsentral'noe Konstruktorskoe Biuro Unikal'nogo Priborostroeniia, Samara, USSR) Optics and Lasers in Engineering (ISSN 0143-8166), vol. 15, no. 5, 1991, p. 357-367. 1991 11 p refs
Copyright

The vibroshifting fields generated by turbine blades and aerospace engines are calculated numerically with a mathematical system incorporating holographic-interferometry data. The vibroshift field is computed directly from the interferogram pattern, whereas the deformation and strain of the object are obtained experimentally on the basis of the resulting data. The experimental installation is shown diagrammatically, and algorithms are presented which permit the analysis of brightness distributions of interferogram-pattern points, fringe centers, and the geometrical parameters of the image. Interferogram processing conducted on a PC with 512 x 512-pixel capacity is conducted for a compressor blade by means of the time-averaging and with the proposed local approximation by a second-order surface. The vibroshift vector field and corresponding projection demonstrate the results of detection of dark fringes and filtered skeletons facilitated by the method. C.C.S.

A92-30137
PRESSURE INDICATORS [INDIKATORY DAVLENIIA]
L. B. NEVSKII, G. E. PERVUSHIN, and G. I. SIDEL'NIKOVA TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 98-101. In Russian. 1990 4 p In RUSSIAN refs
Copyright

A method is described for measuring the airflow pressure distribution on the surfaces of aerodynamic test models, based on the ability of oxygen to quench the delayed fluorescence of organic luminophors. Data are presented on measurements of the pressure coefficients for wing profiles at freestream Mach numbers of 0.7, 0.8, and 0.9, and the results are compared with those obtained using a commonly used method. I.S.

A92-31987
A METHOD OF FRACTURE TOUGHNESS TESTING UNDER CYCLIC SHEAR LOADING [METODIKA ISPYTANII NA TRESHCHINOSTOIKOST' PRI TSIKLICHESKOM NAGRUZHENII SDVIGOM]
G. V. TSYBANEV, P. IA. KRAVETS, and A. O. KHOTSIANOVSKII (AN Ukrainy, Institut Problem Prochnosti, Kiev, Ukraine) Problemy Prochnosti (ISSN 0556-171X), no. 1, 1992, p. 75-79. In Russian. 1992 5 p In RUSSIAN refs
Copyright

An experimental procedure is proposed for determining the cyclic fracture toughness characteristics of side-notch plane specimens for different cycle stress ratios. K-calibration is obtained by the finite element method for this testing scheme implemented on a machine for fatigue testing in tension-compression. The method is demonstrated for specimens of AMg6N aluminum alloy. V.L.

A92-33686
OPTIMIZATION OF ESTIMATES OF THE SPATIALLY DISTRIBUTED PARAMETERS OF ELECTRODYNAMIC SURFACE MODELS IN INVERSE INTERPRETATION PROBLEMS IN ACTIVE REMOTE SENSING [OPTIMIZATSIIA OTSENOK PROSTRANSTVENNO-RASPREDELENNYKH PARAMETROV ELEKTRODINAMICHESKIKH MODELEI POVERKHNOSTEI V OBRATNYKH ZADACHAKH INTERPRETATSII PRI AKTIVNOM DISTANTSIONNOM ZONDIROVANII]
V. K. VOLOSIUK, V. F. KRAVCHENKO, and S. E. FAL'KOVICH (NII Tochnykh Priborov, Moscow, Russia; Khar'kovskii Aviatsionnyi Institut, Kharkov, Ukraine) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 322, no. 2, 1992, p. 277-280. In Russian. 1992 4 p In RUSSIAN refs
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A92-33778
A STUDY OF THE PRECISION CHARACTERISTICS OF A GYROSCOPIC GRAVIMETER [ISSLEDOVANIE TOCHNOSTNYKH KHARAKTERISTIK GIROSKOPICHESKOGO GRAVIMETRA]
E. N. BEZVESIL'NAIA (Kievskii Politekhnicheskii Institut, Kiev, Ukraine) Mekhanika Giroskopicheskikh Sistem (ISSN 0203-3771), no. 10, 1991, p. 3-7. In Russian. 1991 5 p In RUSSIAN refs
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A study is made of the effect of perturbation characteristics and design parameters on the systematic error of a gyroscopic gravimeter. It is shown that the accuracy of the gyroscopic gravimeter is superior to that of other types of gravimeters. Such gravimeters are recommended for use in aviation gravimetric systems. V.L.

A92-33781
DYNAMICS OF A TWO-DEGREE-OF-FREEDOM GYROPENDULUM ACCELEROMETER WITH A ROTATING GIMBAL SUSPENSION [O DINAMIKE DVUKHSTEPENNOGO GIROMAIATNIKOVOGO AKSELEROMETRA S VRASHCHAIUSHCHIMSIA KARDANOVYM PODVESOM]
V. S. EVGEN'EV (Kievskii Politekhnicheskii Institut, Kiev, Ukraine) and M. S. RAMZAEVA (Ramenskoe Proektno-Konstruktorskoe Biuro, Ramenskoye, Russia) Mekhanika Giroskopicheskikh Sistem (ISSN 0203-3771), no. 10, 1991, p. 20-23. In Russian. 1991 4 p In RUSSIAN refs
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An analysis is made of the dynamics of a two-degree-of-freedom unbalanced gyroscope with forced rotation of the gimbal suspension mounted on an object in translational motion. It is shown that such an instrument has the properties of a vibrational rotor gyroscope. The conditions of the dynamic tuning of the gyroscope are determined. The possibility of operation in the linear velocity measurement regime is investigated. V.L.

A92-33784
ERRORS OF A CORRECTABLE GYROCOMPASS IN THE PRESENCE OF VIBRATIONS [O POGRESHNOSTIAKH KORREKTIRUEMOGO GIROKOMPASA PRI VIBRATSIIAKH]
L. M. RYZHKOV (Kievskii Politekhnicheskii Institut, Kiev, Ukraine) Mekhanika Giroskopicheskikh Sistem (ISSN 0203-3771), no. 10, 1991, p. 46-49. In Russian. 1991 4 p In RUSSIAN refs
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The error of a single-rotor correctable gyrocompass with a fluid torsion suspension is investigated in the case of the translational vibration of the base. The intercardinal nature of the error is demonstrated. The use of a correcting (filtering) device in the horizontal frame control circuit is recommended for error reduction. The stability condition for a gyrocompass with such a device is determined. V.L.

A92-33798
SOLVING THE INVERSE PROBLEM OF ELECTROMAGNETIC WAVE REFLECTION FROM LAYERED DIELECTRICS BY THE MINIMIZATION METHOD [RESHENIE OBRATNOI ZADACHI OTRAZHENIIA ELEKTROMAGNITNYKH VOLN OT SLOISTYKH DIELEKTRIKOV METODOM MINIMIZATSII]
B. I. KOLODII, O. B. LIASHCHUK, V. A. KOLIASNIKOV, and E. A. BABUSHKIN Otbor i Obrabotka Informatsii (ISSN 0474-8662), no. 7, 1991, p. 93-97. In Russian. 1991 5 p In RUSSIAN refs
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The inverse problem of determining the thickness of two- and three-layer dielectric structures when using a microwave probe is solved by searching for the global minimum of the objective function using the data of full-scale experiments. Without any prior processing of the experimental data (e.g., smoothing) and without a prior analysis of the frequency dependence of the reflection coefficients for a given type of structures, the error of thickness determination may be as high as 15 percent. Methods of improving the accuracy of thickness determination are discussed and illustrated by examples. V.L.

A92-39215
BIOLOGICAL SATELLITE SCIENTIFIC DEVICES
B. L. PEREPECH, V. P. RUMIANTSEV, V. M. GALKIN, S. V. SHAKHVOROSTOV, and S. S. RVACHEV (SKTB Biofizpribor, St. Petersburg, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-234, S-235. Feb. 1991 2 p

The paper describes the NA SBS 9 systems developed for the ninth Cosmos-2044 biological test mission. The NA SBS 9 life support systems designed for monkeys and rats follow standard design of BIOS-Vivarium and BIOS-Primate units. The main features of NA SBS 9 include the use of a recently developed HF physiological data recorder Skat-3; the incorporation into BIOS-Primate of two units intended for biorhythmic studies (the BBI-Zh system for studying beetles and the VITALOG developed by NASA for studies on monkeys); and a new version of BIOS-Primate system incorporating a capacitance-link and an inductance-link temperature transmitters and a brain tissue oxygen tension control channel. I.S.

A92-45112
RECENT RESEARCH AND DEVELOPMENT IN ELECTRON IMAGE TUBES/CAMERAS/SYSTEMS
A. M. PROKHOROV and M. IA. SHCHELEV (Russian Academy of Sciences, General Physics Institute, Moscow, Russia) IN: International Congress on High-Speed Photography and Photonics, 19th, Cambridge, England, Sept. 16-21, 1990, Proceedings 1991 10 p refs
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Recent results in development of the principal components of picosecond image converter recording systems are reviewed focusing on image tubes, streak and framing cameras, and CCD readout devices. Attention is also given to new laser sources capable of generating very stable femtosecond and picosecond optical pulses for dynamic calibration of image tubes and cameras and application of the designed instruments in laser research. O.G.

A92-51311
ALL-UNION CONFERENCE ON OPTICAL METHODS OF FLOW RESEARCH, 1ST, NOVOSIBIRSK, RUSSIA, APR. 1991, PROCEEDINGS [VSESOIUZNAIA KONFERENTSIIA PO OPTICHESKIM METODAM ISSLEDOVANIIA POTOKOV, 1ST, NOVOSIBIRSK, RUSSIA, APR. 1991, DOKLADY]
Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0869-1339), no. 2, Mar.-Apr. 1992, 136 p. In Russian. For individual items see A92-51312 to A92-51325. Apr. 1992 136 p In RUSSIAN
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The papers presented in this volume provide an overview of theoretical and experimental recent research related to the development and application of optical method for measuring the kinematic, structural, and thermodynamic parameters of flows of gases and condensed media. Topics discussed include systems for the optical diagnostics of flow dynamics and phase structure, integral Doppler anemometry, determination of the dynamic characteristics of nonstationary gas flows by interferometric methods, and visualization of hydrodynamic processes. Papers are also presented on using speckle photography in an aerophysical experiment, spectroscopic studies in a nonequilibrium hypervelocity gas flow, and determination of plasma flow velocity from the droplet shape. V.L.

A92-51313
PRACTICAL METHODS OF MINIATURIZING THE FIBER-OPTIC PROBES OF LASER DOPPLER VELOCIMETERS [PRAKTICHESKIE PUTI MINIATIURIZATSII VOLOKONNYKH ZONDOV LDIS]
L. K. IAROVOI (Kievskii Gosudarstvennyi Universitet, Kiev, Ukraine) (Vsesoiuznaia Konferentsiia po Opticheskim Metodam Issledovaniia Potokov, 1st, Novosibirsk, Russia, Apr. 1991, Doklady. A92-51311 21-35) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0869-1339), no. 2, Mar.-Apr. 1992, p. 11-16. In Russian. Apr. 1992 6 p In RUSSIAN refs
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The possibilities for developing miniature fiber-optic probes for laser Doppler velocimeters (LDVs) are examined with reference to specific examples. Based on an analysis of the results of the study, the following possibilities for miniaturizing LDV probes are suggested: (1) developing new types of compact optical circuits with special fiber-optic waveguide matching provisions; (2) developing all-fiber probes in which fiber and microoptical elements are used for generating the probing field; and (3) using special types of waveguides, including waveguides specially developed for LDV probes. V.L.

A92-51320
USING SPECKLE PHOTOGRAPHY IN THE AEROPHYSICAL EXPERIMENT [PRIMENENIE TEKHNIKI SPEKL-FOTOGRAFII V AEROFIZICHESKOM EKSPERIMENTE]
A. A. SHINELEV (Tsentral'nyi Aerogidrodinamicheskii Institut, Zhukovski, Russia) (Vsesoiuznaia Konferentsiia po Opticheskim Metodam Issledovaniia Potokov, 1st, Novosibirsk, Russia, Apr. 1991, Doklady. A92-51311 21-35) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0869-1339), no. 2, Mar.-Apr. 1992, p. 76-81. In Russian. Apr. 1992 6 p In RUSSIAN
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New portable equipment for recording speckle patterns, a new method of single-pulse speckle recording, and a new speckle processing system have been developed specifically for aerodynamic applications. The new equipment and method have been tested in a wind tunnel study of hypersonic (M = 5) flow of air past a sphere. The experimental results are found to be in good agreement with theoretical calculations using a full system of Navier-Stokes equations. V.L.

A92-51323
SPECTROSCOPIC STUDIES IN A NONEQUILIBRIUM HYPERSONIC GAS FLOW [SPEKTROSKOPICHESKIE ISSLEDOVANIIA V NERAVNOVESNOM GIPERSKOROSTNOM POTOKE GAZA]
A. A. KNIAZEV, N. V. LERNER, and K. I. SVINOLUPOV (Saratovskii Gosudarstvennyi Universitet, Saratov, Russia) (Vsesoiuznaia Konferentsiia po Opticheskim Metodam Issledovaniia Potokov, 1st, Novosibirsk, Russia, Apr. 1991, Doklady. A92-51311 21-35) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0869-1339), no. 2, Mar.-Apr. 1992, p. 89-94. In Russian. Research supported by Tsentral'nyi Aerogidrodinamicheskii Institut. Apr. 1992 6 p In RUSSIAN refs
Copyright
Self-luminescent hypersonic air flow with additions of sodium and potassium formed by the secondary nozzle of an MHD accelerator wind tunnel was studied spectroscopically, with panoramic measurements of the velocity and temperature fields conducted within a single run. The flow had a mean velocity of 2-8 m/s and a temperature of 1000-30,000 K; the pressure in the test chamber was 0.01 atm; the jet had a lifetime of 0.2 s and a cross section of 60-360 sq cm. The measurement principle, the general design of the panoramic spectrometer, experimental setup and data processing, and results of the study are discussed. V.L.

A92-51325
VISUALIZATION OF A SUBSONIC NONISOTHERMAL JET [VIZUALIZATSIIA DOZVUKOVOI NEIZOTERMICHESKOI STRUI]
T. N. BEZMENOVA, T. M. MAKARENKO, V. I. RYBAKOV, and V. A. IAKOVLEV (Tsentral'nyi Aerogidrodinamicheskii Institut, Moscow, Russia) (Vsesoiuznaia Konferentsiia po Opticheskim Metodam Issledovaniia Potokov, 1st, Novosibirsk, Russia, Apr. 1991, Doklady. A92-51311 21-35) Sibirskii Fiziko-Tekhnicheskii Zhurnal (ISSN 0869-1339), no. 2, Mar.-Apr. 1992, p. 128-131. In Russian. Apr. 1992 4 p In RUSSIAN refs
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The objective of the study was to develop a method for visualizing low-velocity jets that would provide quantitative and qualitative characterization of coherent structures. The study was conducted in a wind tunnel with a 20-mm-diameter nozzle, with the initial jet velocity varying from 16 to 50 m/s and a jet temperature of 31 C at the nozzle exit section. The visualization was carried out using an experimental shift interferometer. The characteristic features of the visualized coherent structures are discussed. V.L.

A92-51649
THE USE OF PHOTOGRAMMETRY IN AVIATION EQUIPMENT FLIGHT TESTING
KIRA ALBAKIAN (Flight Research Institute, Zhukovski, Russia) IN: Close-range photogrammetry meets machine vision; Proceedings of the Meeting, Zurich, Switzerland, Sept. 3-7, 1990 1990 7 p
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Information on the application of the photogrammetric (PG) method in the flight testing of aviation equipment is summarized. A variety of different approaches are discussed, with reference to specific flight experiment conditions, and special features, advantages, drawbacks, and accuracy characteristics. Results are presented of the repeated application of the PG method for evaluating the accuracy characteristics of various navigation systems and sensors, based on different physical principles. The efficiency of using the PG method in flight-navigation-equipment flight testing is shown. L.M.

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LASERS AND MASERS

Includes parametric amplifiers.

A92-10802
DYNAMICS OF INVERSION ACCUMULATION IN OPTICAL QUANTUM AMPLIFIERS DURING PULSED PUMPING AND BASIC PRINCIPLES OF THE FORMATION OF HIGH-ENERGY SYSTEMS [DINAMIKA NAKOPLENIIA INVERSII V OPTICHESKIKH KVANTOVYKH USILITELIAKH PRI IMPUL'SNOI NAKACHKE I OSNOVNYE PRINTSIPY FORMIROVANIIA VYSOKOENERGETICHNYKH SISTEM]
A. V. SHELOBOLIN (AN SSSR, Fizicheskii Institut, Moscow, USSR) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, June 1991, p. 667-672. In Russian. Jun. 1991 6 p In RUSSIAN refs
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A phenomenological model is employed to consider the process of inversion accumulation in optical quantum amplifiers during pulsed pumping. Theoretical data are compared with experimental data for neodymium-glass amplifiers. The principles of the formation of high-energy amplifier systems as well as restrictions imposed on the efficiency of energy coupling-out by the system are discussed. The optimization of these systems with respect to the resulting efficiency is shown. P.D.

A92-10804
SUPPRESSION OF INTENSITY FLUCTUATIONS IN SEMICONDUCTOR LASERS [PODAVLENIE FLUKTUATSII INTENSIVNOSTI POLUPROVODNIKOVYKH LAZEROV]
I. A. ANDRONOVA and I. L. BERSHTEIN (AN SSSR, Institut Prikladnoi Fiziki, Nizhni Novgorod, USSR) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, June 1991, p. 678-680. In Russian. Jun. 1991 3 p In RUSSIAN refs
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The suppression of intensity fluctuations by injection current feedback is calculated both in the feedback circuit and in the channel where the stabilized radiation is used. The optimal choice of parameters is determined. Experiments with a multifrequency semiconductor laser are described, and their results are shown to be in satisfactory agreement with analytical results. P.D.

A92-10813
DYNAMICS OF THE DEVELOPMENT OF ABSOLUTE INSTABILITY AT THE BRILLOUIN NONLINEARITY IN THE FOUR-WAVE MIXING REGIME [DINAMIKA RAZVITIIA ABSOLIUTNOI NEUSTOICHIVOSTI NA BRILLIUENOVSKOI NELINEINOSTI V REZHIME CHETYREKHVOLNOVOGO SMESHENIIA]
I. IU. ANIKEEV, D. A. GLAZKOV, I. G. ZUBAREV, and S. I. MIKHAILOV (AN SSSR, Fizicheskii Institut, Moscow, USSR) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, June 1991, p. 718-722. In Russian. Jun. 1991 5 p In RUSSIAN

refs
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The scheme of a four-wave hypersonic phase-conjugating mirror is proposed and implemented for observing the development of absolute instability in the case of continuous variation in the wave mismatch. Numerical solutions are presented for dynamic equations which describe four-wave mixing of counterrunning reference waves under conditions of absolute instability, taking the effect of group delay into account. The maximum sensitivity and reflection coefficient of the signal wave in these mirrors are estimated. P.D.

A92-10884
FREQUENCY CHARACTERISTICS OF A MODE-LOCKED SOLID-STATE RING LASER WITH SELF-PUMPING WAVES [CHASTOTNYE KHARAKTERISTIKI TVERDOTEL'NOGO KOL'TSEVOGO LAZERA S VOLNAMI AVTOPODSVETKI V REZHIME SINKHRONIZATSII MOD]
N. V. KRAVTSOV, S. V. PARFENOV, and A. N. SHELAEV (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, May 1991, p. 566-571. In Russian. May 1991 6 p In RUSSIAN refs
Copyright
The paper describes a method for eliminating the competition between counterrunning waves and for stabilizing the beat regime in a rotating solid-state ring laser (SSRL) with a homogeneously broadened active-medium line. These qualities are achieved by the use of a self-pumping wave (SPW) generated under steady-state mode locking by means of diffractional acoustooptic feedback. The effects of the SPW, the laser parameters, and the nonreciprocal acoustic effects on the amplitude-frequency characteristics were investigated, revealing significant distortions of the SSRL's frequency characteristics, due to the frequency modulation of ultrashort light pulses. I.S.

A92-12181
ANALYSIS OF THE DIRECT AND THE INVERSE PROBLEM FOR INTERNAL SUPERSONIC FLOW OF A VISCOUS GAS WITH THREE-DIMENSIONAL HEAT SUPPLY [RASCHET PRIAMOI I OBRATNOI ZADACHI DLIA VNUTRENNEGO SVERKHZVUKOVOGO TECHENIIA VIAZKOGO GAZA S OB'EMNYM TEPLOPODVODOM]
S. G. KARATAEV and V. N. KOTEROV Zhurnal Vychislitel'noi Matematiki i Matematicheskoi Fiziki (ISSN 0044-4669), vol. 31, Sept. 1991, p. 1419-1423. In Russian. Sep. 1991 5 p In RUSSIAN refs
Copyright
The paper is concerned with the supersonic flow of a viscous gas with a three-dimensional heat supply, a problem modeling energy dissipation in the discharge channel of a CW supersonic CO laser. The gas flow is calculated by using Navier-Stokes equations parabolized in terms of the variables current function-orthogonal complement. Solution results are presented for both the direct and the inverse problem. V.L.

A92-14279
LASER-BEAM HARDENING AND ALLOYING OF MACHINE PARTS [UPROCHNENIE I LEGIROVANIE DETALEI MASHIN LUCHOM LAZERA]
VLADIMIR S. KOVALENKO, LEONID F. GOLOVKO, and VIKTOR S. CHERNENKO Kiev, Izdatel'stvo Tekhnika, 1990, 192 p. In Russian. 1990 192 p In RUSSIAN refs
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The technical specifications of some repetitively pulsed and CW lasers used for the hardening and alloying of metal parts are presented, and processes of laser-beam hardening, microalloying, and amorphization are described. The optimum regimes of laser-beam hardening are determined. The effect of laser treatments on the service-related properties of metal materials is assessed. V.L.

A92-18238
LASER GYROMETERS AND THEIR APPLICATIONS [LAZERNYE GIROMETRY I IKH PRIMENENIE]
VALERII V. SEREGIN and RAFAEL' M. KUKULIEV Moscow, Izdatel'stvo Mashinostroenie, 1990, 288 p. In Russian. 1990 288 p In RUSSIAN refs
Copyright
Some problems associated with the implementation of a laser gyrometer as a transducer in automatic control systems are examined. Mathematical models of the laser gyrometer are presented, and its characteristics and performance are analyzed. Methods for the selection of parameters are discussed. The discussion also covers problems in the synthesis of semianalytical inertial navigation systems based on laser gyrometers. V.L.

A92-18288
SOME CHARACTERISTICS OF THE PULSED LASER HARDENING OF TITANIUM ALLOYS [NEKOTORYE OSOBENNOSTI IMPUL'SNOGO LAZERNOGO UPROCHNENIIA TITANOVYKH SPLAVOV]
A. P. LIUBCHENKO, E. A. SATANOVSKII, V. N. PUSTOVOIT, G. I. BROVER, V. N. VARAVKA, and E. A. KATSNEL'SON Fizika i Khimiia Obrabotki Materialov (ISSN 0015-3214), Nov.-Dec. 1991, p. 130-134. In Russian. Dec. 1991 5 p In RUSSIAN refs
Copyright
The characteristic features of the pulsed laser treatment of titanium alloys are examined with particular reference to experimental results obtained for VT3-1 alloy. It is found that laser treatment leads to the formation of a hardened surface layer 70-100 microns deep whose hardness exceeds that of the base metal by a factor of 1.1-1.6. The observed hardening effect is attributed to the concentration and morphological inhomogeneity of the solid solutions, formation of the alpha prime martensitic phase, and saturation by nitrogen and carbon from the air and from the coatings. V.L.

A92-27558
ADAPTIVE INTRACAVITY CONTROL OF THE MODE STRUCTURE OF SOLID-STATE LASER RADIATION [ADAPTIVNOE VNUTRIREZONATORNOE UPRAVLENIE MODOVYM SOSTAVOM IZLUCHENIIA TVERDOTEL'NOGO LAZERA]
M. A. VORONTSOV, A. V. KORIABIN, V. I. POLEZHAEV, and V. I. SHMAL'GAUZEN (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, Aug. 1991, p. 904, 905. In Russian. Aug. 1991 2 p In RUSSIAN refs
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A pulsed solid-state laser with a system of adaptive intracavity control of the surface profile of the output mirror is investigated. The automatic control of the radiation mode structure was implemented experimentally. The adaptive intracavity correction of the tilts, defocusing, and astigmatisms of the wavefront made it possible to stabilize the radiation pattern diagram and to increase the total power under conditions of the fundamental mode during an increase in the intensity at the beam axis. P.D.

A92-27569
FOUR-WAVE STIMULATED EMISSION IN A RESONANTLY ABSORBING GAS WITH AMPLIFICATION IN A FEEDBACK LOOP [CHETYREKHVOLNOVAIA GENERATSIIA V REZONANSNO-POGLOSHCHAIUSHCHEM GAZE S USILENIEM V PETLE OBRATNOI SVIAZI]
I. M. BEL'DIUGIN, A. P. SUKHORUKOV, V. N. TITOV, and V. A. TROFIMOV (Moskovskii Gosudarstvennyi Universitet, Moscow, Russia) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, Aug. 1991, p. 972-977. In Russian. Aug. 1991 6 p In RUSSIAN refs
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A numerical study is presented of the development dynamics of stimulated emission in a resonantly absorbing gas in a scheme with amplification in the feedback loop. A mechanism related to

the transition saturation is found for the self-limitation of the duration of the emitted pulse. The possible optimization of the lasing process is considered. P.D.

A92-27607
THEORETICAL ANALYSIS OF THE FORMATION OF AN ACTIVE MEDIUM IN A SUPERSONIC OXYGEN-IODINE LASER [TEORETICHESKII ANALIZ FORMIROVANIIA AKTIVNOI SREDY V SVERKHZVUKOVOM KISLORODNO-IODNOM LAZERE]
N. L. KUPRIIANOV and S. P. SANNIKOV (AN SSSR, Fizicheskii Institut, Samara, USSR) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, Sept. 1991, p. 1051-1055. In Russian. Sep. 1991 5 p In RUSSIAN refs
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A theoretical model is proposed for the dissociation kinetics of molecular iodine in singlet oxygen in the case of the flow of the gas mixture through a supersonic nozzle. Two variants of iodine mixing are considered: in subsonic and in supersonic regions. A procedure for the general analysis of the problem is presented which includes calculation of the limiting regimes, with presentation of the results through similarity parameters. L.M.

A92-28290
EFFECT OF THE FEEDBACK LOOP CHARACTERISTICS ON THE FIELD STRUCTURE IN A RING PHASE-CONJUGATE MIRROR [VLIIANIE KHARAKTERISTIK PETLI OBRATNOI SVIAZI NA STRUKTURU POLEI V KOL'TSEVOM OVF-ZERKALE]
A. A. ESAIAN, A. A. ZOZULIA, and V. T. TIKHONCHUK (AN SSSR, Fizicheskii Institut; Moskovskii Inzhenerno-Fizicheskii Institut, Moscow, USSR) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, Oct. 1991, p. 1194-1196. In Russian. Oct. 1991 3 p In RUSSIAN refs
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Stimulated scattering in a ring resonator formed by a self-intersecting beam is analyzed for the case of the simultaneous rotation and compression of the beam cross section in the feedback loop. Conditions for the excitation of emission are determined, and the quality of phase conjugation near the lasing threshold is evaluated. For a cylindrical pumping beam, the phase-conjugation quality parameter is estimated at 40-85 percent, depending on the beam cross-sectional compression ratio. V.L.

A92-28324
THE ANGULAR SPECTRUM OF PLASMA LASER RADIATION WITH FEATURES OF THE OPTICAL PROPERTIES OF THE ACTIVE MEDIUM TAKEN INTO ACCOUNT [UGLOVOI SPEKTR IZLUCHENIIA PLAZMENNOGO LAZERA S UCHETOM OSOBENNOSTEI OPTICHESKIKH SVOISTV AKTIVNOI SREDY]
V. A. VOLKOV, V. K. LADAGIN, F. A. STARIKOV, and V. D. URLIN (VNII Eksperimental'noi Fiziki, Arzamas, Russia) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, Nov. 1991, p. 1329, 1330. In Russian. Nov. 1991 2 p In RUSSIAN refs
Copyright
The divergence of the stimulated radiation in a laser plasma is calculated for different electron density profile shapes. Qualitative agreement is obtained between the theoretical and experimental directivity diagrams of the radiation due to the 3p-3s transitions in Ne-like selenium for a uniform gain profile in the active medium. P.D.

A92-30244
NONLINEAR DYNAMICS OF TRANSVERSE MODES IN LARGE-APERTURE INJECTION LASERS [NELINEINAIA DINAMIKA POPERECHNYKH MOD V SHIROKOAPERTURNYKH INZHEKTSIONNYKH LAZERAKH]
IU. I. BALKAREI, M. G. EVTIKHOV, A. S. KOGAN, O. A. PASHKO, S. V. TVERDOV, and B. B. ELENKRIG (AN SSSR, Institut Radiotekhniki i Elektroniki, Fryazino, USSR) Zhurnal Tekhnicheskoi Fiziki (ISSN 0044-4642), vol. 61, July 1991, p. 84-92. In Russian. Jul. 1991 9 p In RUSSIAN refs
Copyright
The dynamic behavior of self-focused lasing channels in large-aperture injection lasers are examined. A model considering a single longitudinal mode is used to investigate the transverse mode spectrum adjacent to the longitudinal mode and instabilities of transverse modes. The numerically modeled structures arise as a result of the instability of various numbers of modes with envelope frequencies higher than that of the electron-photon resonance. Low-frequency modulation is detected against the background of high frequencies. The high-frequency fluctuations of the envelope can be used in the generation of picosecond pulses. V.L.

A92-30268
OPTICAL ACTIVITY OF INERT GAS HALIDES IN THE IR SPECTRAL REGION [OPTICHESKAIA AKTIVNOST' GALOGENIDOV INERTNYKH GAZOV V IK-OBLASTI SPEKTRA]
V. V. DATSIUK and I. A. IZMAILOV (AN Ukrainy, Institut Poluprovodnikov, Kiev, Ukraine) Kvantovaia Elektronika (ISSN 0368-7155), no. 40, 1991, p. 25-30. In Russian. 1991 6 p In RUSSIAN refs
Copyright
The IR activities of excimers due to transitions between different electron states are predicted. The detection of spontaneous and induced IR transitions in excimer molecules is shown to be possible in the active cross sections of excimer lasers. IR spectrum measurements can thus be used for determining spectroscopic constants. V.L.

A92-30348
A MEASURING AND COMPUTING SYSTEM FOR LIDAR MONITORING OF ATMOSPHERIC IMPURITIES [IZMERITEL'NO-VYCHISLITEL'NAIA SISTEMA DLIA LIDARNOGO MONITORINGA ATMOSFERNYKH PRIMESEI]
P. V. GOLUBTSOV, IU. P. PYT'EV, and O. A. FILATOVA (Moskovskii Gosudarstvennyi Universitet, Moscow, Russia) Optika Atmosfery (ISSN 0235-277X), vol. 4, Oct. 1991, p. 1100-1105. In Russian. Oct. 1991 6 p In RUSSIAN refs
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Attention is given to the determination of concentrations of atmospheric impurities by the differential absorption method. Analysis of the complex nonlinear multidimensional measurement system makes it possible to perform series-parallel decomposition of measurements into their simpler components, for each of which an optimal reduction transformation can be constructed. P.D.

A92-33706
NUMERICAL ANALYSIS OF THE CHARACTERISTICS OF THERMALLY EXCITED TRANSVERSE-FLOW N2-DCL LASERS [CHISLENNYI ANALIZ KHARAKTERISTIK PROTOCHNYKH LAZEROV NA SMESI N2-DCL S TEPLOVYM SPOSOBOM VOZBUZHDENIIA]
N. G. DAUTOV and A. M. STARIK (Tsentral'nyi Institut Aviatsionnogo Motorostroeniia, Moscow, Russia) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 30, Jan.-Feb. 1992, p. 163-172. In Russian. Feb. 1992 10 p In RUSSIAN refs
Copyright
The energy characteristics of gasdynamic N2-DCl lasers are analyzed numerically using a model of local vibrational temperatures. In the transverse-flow thermally excited N2-DCl lasers considered here, the preliminary mixing of the components takes place before the heating chamber, and the excited molecular nitrogen is mixed with cold DCl gas in the supersonic section of the nozzle. The results are presented in graphic form. V.L.

A92-36451
ALL-UNION SYMPOSIUM ON THE PROPAGATION OF LASER RADIATION IN THE ATMOSPHERE AND WATER BODIES, 11TH, TOMSK, RUSSIA, JUNE 1991, PROCEEDINGS [VSESOIUZNYI SIMPOZIUM PO RASPROSTRANENIIU LAZERNOGO IZLUCHENIIA V ATMOSFERE I VODNYKH SREDAKH, 11TH, TOMSK, RUSSIA, JUNE 1991, PROCEEDINGS]
V. P. LUKIN, ED. Symposium sponsored by Russian Academy of Sciences. Optika Atmosfery (ISSN 0235-277X), vol. 4, no. 12, Dec. 1991, 112 p. In Russian. For individual items see A92-36452 to A92-36467. Dec. 1991 112 p In RUSSIAN
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The papers presented in this volume provide an overview of recent theoretical and experimental research related to atmospheric adaptive optics. Topics discussed include the simplex method in the problem of light beam phase optimization in a nonlinear medium; implementation of amplitude-phase beam control in a two-mirror adaptive system; and the gradient method in the problem of minimizing the angular divergence of light beams. Papers are also presented on the possibility of controlling the phase of emission of optically coupled lasers; modal representation of atmospheric inhomogeneities in the numerical analysis of the statistical characteristics of a light beam; and spectral and dynamic characteristics of adaptive imaging systems. V.L.

A92-41489
HIGH POWER MILLISECOND ND GLASS LASER - PHYSICS OF SUBSONIC OPTICAL DISCHARGES
V. B. FEDOROV, I. A. BUFETOV, and V. K. FOMIN (Russian Academy of Sciences, General Physics Institute, Moscow, Russia) IN: Lasers '90; Proceedings of the 13th International Conference on Lasers and Applications, San Diego, CA, Dec. 10-14, 1990 1991 8 p
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The high-energy millisecond Nd glass laser and its application to laser plasma physics or to the physics of optical discharges are discussed. It is found that the limitation of a side gas expansion in an optical discharge results in a plasma absorption increase in a dramatic increase of plasma front propagation velocities in laser beams up to supersonic values. These results may be used for treating the different optical discharges both in gas and on solid targets. P.D.

A92-41500
APPLICATION OF APODIZED APERTURES FROM IMPROVEMENT OF BEAM QUALITY AND OUTPUT CHARACTERISTICS OF IR AND VISIBLE HIGH-POWER LASERS
SVETLANA G. LUKISHOVA (Russian Academy of Sciences, Institute of Radioengineering and Electronics, Moscow, Russia), NESTOR R. M. MENDEZ (Hospital Lima Peru, Lima), VALERII V. TER-MIKIRTYCHEV, and TAMARA V. TULAIKOVA (Russian Academy of Sciences, Institute of General Physics, Moscow, Russia) IN: Lasers '90; Proceedings of the 13th International Conference on Lasers and Applications, San Diego, CA, Dec. 10-14, 1990 1991 8 p refs
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Four kinds of UV, visible, and IR single-pulse lasers with high damage threshold soft or apodized apertures (AA) are presented. AAs of 3-45 mm diameter and smooth monotonic flat-top profiles, fabricated by absorption under electron beam irradiation and by photodissociation of color centers by short-wavelength light irradiation, were used in 1.06 micron laser amplifier systems to suppress hard-edge Fresnel diffraction rings in beam cross-section and to increase the second harmonic conversion efficiency. AA of 3-4 mm diameter with bell-like transmission profiles, fabricated by photodissociation, were placed inside 2.94 micron and 1.06 micron resonators of master oscillators. A tendency to increase the output energy by 1.3-1.8 times and diminish the beam divergence in single-mode lasing compared to a hard-edge aperture is observed. C.D.

A92-46515
ENERGY CONVERSION EFFICIENCY OF RADIATION INTO A MECHANICAL IMPULSE IN A LASER THRUSTER [EFFEKTIVNOST' PREOBRAZOVANIIA ENERGII IZLUCHENIIA V MEKHANICHESKII IMPUL'S V REAKTIVNOM LAZERNOM DVIZHITELE]
R. A. LIUKONEN and A. M. TROFIMENKO Pis'ma v Zhurnal Tekhnicheskoi Fiziki (ISSN 0320-0116), vol. 18, no. 7, April 12, 1992, p. 76-80. In Russian. 12 Apr. 1992 5 p In RUSSIAN refs
Copyright
Experimental studies have been conducted which demonstrate the feasibility of varying the reactive thrust force in a wide range during the laser acceleration of bodies in the atmosphere and in vacuum. Specific recoil impulses up to 70 dyn s/J have been realized on a flat target. A laser thruster model using CO2 lasers was employed in the experiments. L.M.

A92-46530
APODIZATION OF LASER RADIATION BY PHASE PINHOLES [APODIZATSIIA LAZERNOGO IZLUCHENIIA FAZOVYMI DIAFRAGMAMI]
N. I. POTAPOVA and A. D. TSVETKOV (Gosudarstvennyi Opticheskii Institut, Sosnovyi Bor, Russia) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 19, no. 5, May 1992, p. 460-464. In Russian. May 1992 5 p In RUSSIAN refs
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Numerical simulation and experimental investigations are used to identify regularities of apodization of laser beams by pinholes with an optical inhomogeneity gradient. Optical parameters which make it possible to achieve maximal apodization are found. Amplitude-phase pinholes with a narrow zone of variable transmittance are shown to feature the best apodizing properties at a high pulse duty factor. P.D.

A92-46539
NUMERICAL SIMULATION OF A CW H(D)-O3-CO2 CHEMICAL LASER [CHISLENNOE MODELIROVANIE NEPRERYVNOGO KHIMICHESKOGO H/D/-O3-CO2-LAZERA]
A. IU. MIASNIKOV, IU. P. NESHCHIMENKO, and A. A. TUBIN (Moskovskii Inzhenerno-Fizicheskii Institut, Moscow, Russia) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 19, no. 5, May 1992, p. 498, 499. In Russian. May 1992 2 p In RUSSIAN refs
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A quasi-1D model of a supersonic chemical laser which takes the turbulent character of mixing, shock-wave processes, and reactions of nozzle walls into account is suggested. A mixing thermally initiated OD-CO2 mixing laser is employed to validate the model, and good agreement between theoretical and experimental data is obtained. The laser with a chemical generator of hydrogen atoms provides significantly lower specific output energy than was obtained in previous studies. P.D.

A92-51250
THE ACOUSTOOPTIC CONTROL OF AL2O3:TI(3+) LASER PARAMETERS WITH LAMP PUMP
A. P. SHKADAREVICH, A. A. DEMIDOVICH (Belorussian Academy of Sciences, Institute of Physics, Minsk, Belarus), V. I. KRAVCHENKO, and V. V. TARANOV (Ukrainian Academy of Sciences, Institute of Physics, Kiev, Ukraine) IN: OSA Proceedings on Advanced Solid-State Lasers. Vol. 10 - Proceedings of the Topical Meeting, Hilton Head, SC, Mar. 18-20, 1991 1991 3 p
Copyright
The optimization of laser parameters of titanium-doped alumina type lasers is reported. The possibility of highly effective electronic tuning of the flash-lamp pumped Al2O3:Ti(3+) laser with an acoustooptic deflector is demonstrated. P.D.

A92-57460
LASING DYNAMICS IN THE CASE OF SINGLE-PASS NONLINEAR NOISE AMPLIFICATION IN AN OPTICALLY INHOMOGENEOUS MEDIUM [DINAMIKA IZLUCHENIIA PRI ODNOPROKHODNOM NELINEINOM USILENII SHUMA V OPTICHESKI NEODNORODNOI SREDE]
F. A. STARIKOV (VNII Eksperimental'noi Fiziki, Arzamas, Russia) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 19, no. 6, June 1992, p. 527-531. In Russian. Jun. 1992 5 p In RUSSIAN refs
Copyright
Single-pass amplification of the emission of a spontaneous source in an optically inhomogeneous medium in the form of a cylinder or a plane layer with nonresonance losses and gain saturation is investigated using the quasi-optic equation for a transverse correlation function. Approximate analytical expressions are obtained for the output power of the emission from the end and side surfaces of the active medium for uniformly and nonuniformly broadened lines; the angular spectra of the stimulated emission are presented. Refraction losses and optimal energy dumping through the side surface are discussed. V.L.

N92-70218 Nauchno-Issledovatelskii Inst. Ehlekt- Rofizicheskoj Apparatury, Leningrad (USSR).
NUMERICAL SIMULATION AND OPTIMIZATIONAL CALCULATIONS OF KRF EXCIMER LASERS FOR CONTROLLED FUSION
M. I. AVRAMENKO, V. A. BURTSEV, and A. G. GRAD 1989 18 p In RUSSIAN
(DE91-643167; NIIEFA-P-K-0833) Avail: CASI HC A03/MF A01
The paper deals with the problems of numerical simulation of large-aperture excimer lasers, designated for application as drivers in laser thermonuclear reactor with inertial plasma confinement. Results of numerical optimization of the process of energy contribution of a heavy current electron beam to inert gas are presented. These results and results of investigation of active medium kinetics and energy measurement were used for optimizational calculations of KrF-laser parameters with respect to output radiation energy and total efficiency. DOE

N92-70528 Academy of Sciences of the Ukrainian SSR, Kiev. Inst. of Physics.
SPACE-TIME CHARACTERISTICS OF THE COPPER-VAPOR LASER WITH A NONLINEAR MIRROR [PROSTRANSTVENNO-VREMENNYE KHARAKTERISTIKI LAZERA NA PARAX MEDI S NELINEINYM ZERKALOM]
V. IU. BAZHENOV and S. F. LIUKSIUTOV 1989 29 p In RUSSIAN
Avail: CASI HC A03
The emergence in the system of oscillation modes with complex distribution structures are discovered and their dynamics are studied. The possibility of ordering a random structure field of a resonator through the presence of local response in a photorefractive crystal is illustrated. Transl. by L.K.H.

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MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

A92-15594
GAS-GENERATOR WITH HIGH-TEMPERATURE PATH CERAMIC COMPONENTS
A. V. SUDAREV, V. H. DUBERSHTEIN, V. P. KOVALEVSKII, and A. E. GINZBURG (Vsesoiuznyi Nauchno-Issledovatel'skii Tekhnologicheskii Institut Energeticheskogo Mashinostroeniia, Leningrad, USSR) ASME, International Gas Turbine and Aeroengine Congress and Exposition, 36th, Orlando, FL, June 3-6, 1991. 9 p. Jun. 1991 9 p refs
(ASME PAPER 91-GT-152)
The paper presents a theoretical design study of ceramic components of gas turbine units (GTUs) for a multishaft gas generator. An investigation of the efficiency and application of various materials for ceramic turbine wheels was conducted, including an analysis of thermal and stress state of rotor ceramic components. As a result, the design of various components, including turbine rotor, was improved. I.S.

A92-16811
EFFECT OF INERTIA FORCES ON THE CHARACTERISTICS OF A LONG HYDRODYNAMIC VIBRATION DAMPER IN THE MIXED FLOW REGIME [VLIIANIE SIL INERTSII NA KHARAKTERISTIKI DLINNOGO GIDRODINAMICHESKOGO DEMPFERA VIBRATSII PRI SMESHANNOM REZHIME TECHENIIA]
V. B. BALIAKIN and A. I. BELOUSOV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 40-43. In Russian. 1990 4 p In RUSSIAN refs
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The effect of the convective forces of inertia on the dynamic characteristics of a long hydrodynamic damper in the mixed flow regime is estimated. It is shown, in particular, that the presence of inertia forces gives rise to a radial component of the hydrodynamic force which contributes to an increase in the rotor vibration amplitude. The effect of lubricant cavitation is also discussed. V.L.

A92-18232
COMBUSTION CHAMBERS OF GAS TURBINE PLANTS - COMBUSTION INTENSIFICATION [KAMERY SGORANIIA GAZOTURBINNYKH USTANOVOK - INTENSIFIKATSIIA GORENIIA]
ANATOLII V. SUDAREV and VLADIMIR A. MAEV Leningrad, Izdatel'stvo Nedra, 1990, 276 p. In Russian. 1990 276 p In RUSSIAN refs
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The available experience related to the intensification of combustion in the combustion chambers of gas turbine plants is presented in a systematic manner. In particular, a comparative analysis is made of methods of flame stabilization and aerodynamic structure formation in the case of diffusion combustion behind blunt bodies. A new method of multiple-jet fuel combustion is considered. Results of studies of the combustion process in model, pilot, and full-scale combustion chambers are reported. V.L.

A92-30361
SYNTHESIS OF ELECTROMAGNETIC SUSPENSIONS OF PRECISION INSTRUMENTS [SINTEZ ELEKTROMAGNITNYKH PODVESOV TOCHNYKH PRIBOROV]
S. A. SHAKHOV, V. M. KRIKUN, and P. A. RYBAKOV Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriia Priborostroenie (ISSN 0236-3933), Oct.-Dec. 1990, p. 98-109. In Russian. Dec. 1990 12 p In RUSSIAN refs
Copyright
Computer techniques have been applied to the synthesis of magnetic-resonance suspensions which are optimal from the viewpoints of lifting capacity, rigidity, perturbing moments, and energy consumption. Computational algorithms are presented for the optimization of electromagnetic suspensions with cylindrical and spherical rotors for gyroscopic instruments. L.M.

A92-33791
A THREE-DEGREE-OF-FREEDOM ELECTROMECHANICAL TRANSDUCER IN A GYROSCOPIC STABILIZATION SYSTEM [TREKHSTEPENNOI ELEKTROMEKHANICHESKII PREOBRAZOVATEL' V SISTEME GIROSKOPICHESKOI STABILIZATSII]
E. V. DVOINYKH (Kievskii Politekhnicheskii Institut, Kiev, Ukraine) Tekhnicheskaia Elektrodinamika (ISSN 0204-3599), Sept.-Oct.

1991, p. 45-50. In Russian. Oct. 1991 6 p In RUSSIAN refs
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The possibility of using a gyroscopic drive based on a three-degree-of-freedom electromechanical transducer as part of a moving-platform angular stabilization system is investigated. The principle of operation of such a system is briefly discussed. The accuracy of an implementation of the gyroscopic angular stabilization system using an existing three-degree-of-freedom electromechanical transducer is evaluated in quantitative terms. V.L.

A92-36598
DEPOSITION OF PLASMA-SPRAYED COATINGS [NANESENIE POKRYTII PLAZMOI]
VLADIMIR V. KUDINOV, PETR IU. PEKSHEV, VLADIMIR E. BELASHCHENKO, OLEG P. SOLONENKO, and VIACHESLAV A. SAFIULLIN Moscow, Izdatel'stvo Nauka, 1990, 408 p. In Russian. 1990 408 p In RUSSIAN refs
(ISBN 5-02-006040-2) Copyright

Theoretical concepts and experimental data relevant to the deposition of plasma-sprayed coatings are presented. In particular, attention is given to the phenomenological aspects of plasma spraying, method of studying plasma-spraying processes, physicomathematical modeling of the disperse phase in plasma flow, and interaction between the sprayed particles and the substrate. The discussion also covers the structure of plasma-sprayed materials and the use of statistical methods for predicting the properties of the sprayed coatings. V.L.

A92-42764
DYNAMICS OF AN ASYMMETRIC RIGID ROTOR IN BEARINGS WITH ROTATING ELASTIC ELEMENTS [DINAMIKA NESIMMETRICHNOGO ZHESTKOGO ROTORA V OPORAKH S VRASHCHAIUSHCHIMISIA UPRUGIMI ELEMENTAMI]
E. L. GOLUB and M. I. PAVLINOV Rossiiskaia Akademiia Nauk, Izvestiia, Mekhanika Tverdogo Tela (ISSN 0572-3299), no. 1, Jan.-Feb. 1992, p. 19-24. In Russian. Feb. 1992 6 p In RUSSIAN refs
Copyright

Equations of small oscillations are obtained for a nonsymmetric rigid rotor mounted in bearings with nonsymmetric rotating elastic elements. It is shown that, in certain cases, the instability of rotor oscillations, related to the asymmetry of the rotor, can be eliminated through the asymmetry of the bearings or by sufficient damping in the bearings. An analysis of forced vibrations is presented. V.L.

A92-51801
PECULIARITIES AND FUTURE DEVELOPMENT OF SPACE WELDING
V. F. SHULYM, V. F. LAPCHINSKII (Ukrainian Academy of Sciences, Institute of Electrical Welding, Kiev, Ukraine), V. P. NIKITSKII (NPO Energiia, Moscow, Russia), D. L. DEMIDOV (Ukrainian Academy of Sciences, Institute of Electrical Welding, Kiev, Ukraine), and L. O. NEZNAMOVA (NPO Energiia, Moscow, Russia) IN: Welding in space and the construction of space vehicles by welding; Proceedings of the Conference, New Carrollton, MD, Sept. 24-26, 1991 1991 13 p refs
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The paper deals with the peculiar features of space as a medium in which welding operations are performed. Studies of different methods of welding carried out both in the plane-laboratory and in space are briefly described, and the comparative characteristics of the most promising methods of welding for space conditions are given. The selection of electron beam as a basic method for space is supported. The paper considers the main welding processes performed in space with the help of an electron beam, such as heating, brazing, welding, cutting and coating. Author

A92-51803
WELDING EQUIPMENT FOR SPACE APPLICATIONS
V. A. DZHANIBEKOV (Centre of Cosmonauts Training, Moscow, Russia), A. A. ZAGREBEL'NYI, S. S. GARVISH, V. V. STESIN, V. D. SHELIAGIN (Ukrainian Academy of Sciences, Institute of Electrical Welding, Kiev, Ukraine), N. N. IURCHENKO (Ukrainian Academy of Sciences, Institute of Electrodynamics, Kiev, Ukraine), and A. V. MARKOV (NPO Energiia, Moscow, Russia) IN: Welding in space and the construction of space vehicles by welding; Proceedings of the Conference, New Carrollton, MD, Sept. 24-26, 1991 1991 10 p refs
Copyright

A survey is presented of representative Soviet-period equipment for welding, brazing, coating, and cutting operations that are to be conducted in EVA and other microgravity/vacuum conditions by cosmonauts. Power-supply and process information-processing units are essential components of the 'Isparitel', 'Yantar', and hand-held 'Uri' equipment discussed; in addition, these welding equipment designs strove to achieve the greatest possible lightness, compactness, and energy efficiency. Accounts are given of cosmonaut EVA operational experience with the welding equipment presented. O.C.

A92-51815
THE FLASH-BUTT WELDING OF ALUMINIUM ALLOYS
S. I. KUCHUK-IATSENKO, V. T. CHEREDNICHOK, and L. A. SEMENOV IN: Welding in space and the construction of space vehicles by welding; Proceedings of the Conference, New Carrollton, MD, Sept. 24-26, 1991 1991 11 p
Copyright

Flash-butt welding (FBW) of high-strength aerospace Al alloys is conducted without gaseous-medium shielding and has undergone substantial development in the direction of automated operations. FBW yields virtually no pores, discontinuities, or cracks, and is therefore ideal for gas-impermeable joints. The dimensional accuracies achievable by FBW are a function of weld are inner stresses that are a full order of magnitude smaller than those of arc-welding methods. NDI methods can be incorporated into an automated FBW apparatus for direct inspection of welds. O.C.

A92-51819
CAD-SYSTEMS FOR SPACE WELDED STRUCTURE DESIGN TAKING INTO ACCOUNT RESIDUAL WELDING STRESSES AND POSSIBLE DEFECTS
V. I. MAKHNENKO (Ukrainian Academy of Sciences, Institute of Electrical Welding, Kiev, Ukraine) IN: Welding in space and the construction of space vehicles by welding; Proceedings of the Conference, New Carrollton, MD, Sept. 24-26, 1991 1991 12 p refs
Copyright

An account is given of Soviet efforts toward the CAD-based automated design and fabrication of welded joints for space applications requiring on-orbit production. These automated systems are based on a combination of the requisite data bases on residual welding stresses, resulting mechanical properties, etc., and calculation predictions of the cyclic and static loading of structural components. The material presented is reflective of Soviet experiences with on-orbit welding operations. O.C.

A92-51821
EXPLOSION WELDING AND CUTTING IN AEROSPACE ENGINEERING
L. A. VOLGIN, A. IA. KOROTEEV, A. P. MALAKOVICH, V. G. PETUSHKOV (Ukrainian Academy of Sciences, Institute of Electrical Welding, Kiev, Ukraine), V. G. SITALO (Special Design Bureau 'luzhnaia', Dnepropetrovsk, Ukraine), and V. K. NOVIKOV (NPO Molniia, Moscow, Russia) IN: Welding in space and the construction of space vehicles by welding; Proceedings of the Conference, New Carrollton, MD, Sept. 24-26, 1991 1991 12 p refs
Copyright

The paper presents the results of works of the E.O. Paton Electric Welding Institute and other Soviet organizations on the development of technology for explosion-welding of multilayer transition pieces and pipes used in the manufacture of aerospace products. Equipment and accessories used for this technology are described; in particular, a powerful explosion chamber of a

tubular structure for up to 200 kg of explosives is presented. Information is also given about linear explosion separation devices. Author

A92-54856
APPLICATION OF CONDUCTOR ELECTRIC EXPLOSION TO JOIN CERAMICS
K. A. IUSHCHENKO, V. S. NESMIKH, and I. V. DUBOVETSKII (AN Ukrainy, Institut Elektrosvarki, Kiev, Ukraine) IN: Advances in joining newer structural materials; Proceedings of the International Conference, Montreal, Canada, July 23-25, 1990 1990 8 p refs
Copyright

A process is introduced and tested for the welding of ceramics based the electric explosions of conductors. An experimental investigation is conducted to demonstrate how the shapes of discharge-current curves and joint properties of ceramic materials can be affected by the effects of discharge-pulse welding parameters. The welding is undertaken with a device consisting of a capacitor bank, control unit, controlled high-voltage discharger, and a specimen clamp with discharge circuit electrodes. The values are given for charge voltage, capacitance, and pressures that lead to effective welds. The ceramic joint is formed by discharge-current growth followed by sudden recovery of discharge-gap conductivity, and shunting discharge is found to be critical to joint strength. Conductor electric explosion is shown to be an effective technique for joining ceramic materials with dielectric properties that are used in aerospace and other applications. C.C.S.

A92-54859
BRAZING OF SHEET COMPOSITE MATERIALS WITH ALUMINIUM MATRIX
V. F. KHORUNOV, V. S. KUCHUK-IATSENKO, I. S. DYKHNO, and N. V. KASATKINA (AN Ukrainy, Institut Elektrosvarki, Kiev, Ukraine) IN: Advances in joining newer structural materials; Proceedings of the International Conference, Montreal, Canada, July 23-25, 1990 1990 11 p refs
Copyright

The technique of brazing composite sheets with an aluminum matrix is investigated for Al matrices with either stainless steel or boron fibers. Brazing is compared to other joining techniques, and the relationship between heating and pressure levels is studied by characterizing the joint qualities microscopically. Solder composition is similarly analyzed, and brazing recommendations are given for ranges of joint sizes. Calculations of the temperature fields for the brazing of these composite materials yield specific-heat input data. Optimal brazing modes thus derived for the Al-matrix composites yield joints free of the intermetallide phases that degrade the performance of brazed structures. The tensile strength of the optimized joints is shown to be good relative to the strength of the original composites with Al matrices. C.C.S.

N92-13964*# Academy of Sciences (USSR), Perm. Inst. of Continuous Media Mechanics.
OPTIMAL INTERACTION OF INDENTER WITH INHOMOGENEOUS PLATE
VALERY N. APTUKOV *In* Pennsylvania State Univ., Third International Conference on Inverse Design Concepts and Optimization in Engineering Sciences (ICIDES-3) p 481-488 1991
Avail: CASI HC A02/MF A06

Consideration is given to a new class of problems dealing with an optimal design of an inhomogeneous plate during dynamic penetration of the rigid indenter. The quality criterion of the process is defined by the specific mass of the target, which absorbs the given kinetic mass of the indenter. Parameters of control are expressed in terms of mechanical characteristics, i.e., distribution of density and the related hardness across the plate thickness. The maximum principle of Pontryagin is used to search for the piecewise continuous control function. With consideration of impact conditions and characteristics for a given class of material, an optimal target structure criterion was estimated for engineering applications. Author

N92-27740*# Moscow Inst. of Aviation Technology (USSR).
PROGRESS OF MAGNETIC SUSPENSION SYSTEMS AND MAGNETIC BEARINGS IN THE USSR
A. V. KUZIN *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 p 331-359 May 1992 Previously announced in IAA as A91-38579
Avail: CASI HC A03/MF A04

This paper traces the development and progress of magnetic suspension systems and magnetic bearings in the USSR. The paper describes magnetic bearings for turbomachines, magnetic suspension systems for vibration isolation, some special measuring devices, wind tunnels, and other applications. The design, principles of operation, and dynamic characteristics of the system are presented. Author

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QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

A92-40707
A FEASIBILITY STUDY OF COMPUTERIZED X-RAY TOMOGRAPHY FOR DETERMINING THE STRUCTURAL PARAMETERS OF CARBON PLASTICS [ISSLEDOVANIE VOZMOZHNOSTEI RENTGENOVSKOI VYCHISLITEL'NOI TOMOGRAFII DLIA OPREDELENIIA STRUKTURNYKH PARAMETROV UGLEPLASTIKOV]
V. I. BARAKHOV, V. D. PROTASOV, and A. V. SUKHANOV (Tsentral'nyi NII Spetsial'nogo Mashinostroeniia, Moscow, Russia) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), no. 6, Nov.-Dec. 1991, p. 1043-1052. In Russian. Dec. 1991 10 p In RUSSIAN refs
Copyright

A computerized X-ray tomography method for studying the internal structure of carbon plastics is presented. The method is based on obtaining the density matrices of the composites in the examined cross-section. The statistical data obtained by this method make it possible to estimate the distribution of elementary cell density over the thickness and across the surface of the material. Particular attention is given to specific features of the method under consideration, namely, the error analysis of the matrices of the linear attenuation coefficients (LAC). Conversion from LAC matrices to density matrices makes it possible to obtain volume curves for density variation over the thickness and across the surface of the specimens. Histograms of the density distribution in layers of the material are presented. It is concluded that the computerized tomography is an effective method for structure analysis of carbon plastics. O.G.

A92-52972
A REVIEW OF THERMAL NONDESTRUCTIVE TESTING METHODS FOR AEROSPACE STRUCTURES IN THE FORMER USSR
VLADIMIR P. VAVILOV (Tomsk Polytechnic Institute, Russia) La Recherche Aerospatiale (English Edition) (ISSN 0379-380X), no. 6, 1991, p. 1-16. 1991 16 p refs
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A review is presented of thermal nondestructive testing methods developed in the former USSR, along with several applications dealing with high technology structures and materials commonly utilized in the aerospace industry. The original features and strengths of these studies are highlighted, and some of the weaknesses are pointed out as well. Attention is focused on a better understanding of the subject and to illustrate areas for future cooperation. R.E.P.

N92-13963*# Khmelnitsky Technological Inst. (USSR).
ON DESIGNING FOR QUALITY
L. D. VAJINGORTIN and W. P. ROISMAN *In* Pennsylvania State Univ., Third International Conference on Inverse Design Concepts and Optimization in Engineering Sciences (ICIDES-3) p 469-480 1991
Avail: CASI HC A03/MF A06

The problem of ensuring the required quality of products and/or technological processes often becomes more difficult due to the fact that there is not general theory of determining the optimal sets of value of the primary factors, i.e., of the output parameters of the parts and units comprising an object and ensuring the correspondence of the object's parameters to the quality requirements. This is the main reason for the amount of time taken to finish complex vital article. To create this theory, one has to overcome a number of difficulties and to solve the following tasks: the creation of reliable and stable mathematical models showing the influence of the primary factors on the output parameters; finding a new technique of assigning tolerances for primary factors with regard to economical, technological, and other criteria, the technique being based on the solution of the main problem; well reasoned assignment of nominal values for primary factors which serve as the basis for creating tolerances. Each of the above listed tasks is of independent importance. An attempt is made to give solutions for this problem. The above problem dealing with quality ensuring an mathematically formalized aspect is called the multiple inverse problem. Author

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STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

A92-10844
A PSEUDOMACROCRACK IN AN ANISOTROPIC BODY [PSEVDOMAKROTRESHCHINA V ANIZOTROPNOM TELE]
V. V. TVARDOVSKII Prikladnaia Matematika i Mekhanika (ISSN 0032-8235), vol. 55, July-Aug. 1991, p. 685-690. In Russian. Aug. 1991 6 p In RUSSIAN refs
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A pseudomacrocrack is considered which is an ordinary crack in a composite or an inhomogeneous body whose faces are bound by intact elements of the structure and interact in accordance with a linear law. In this case, normal tension is shown to be sufficient for the generation of a nonzero stress intensity factor at the crack tip. The problem is reduced to that of solving Prandtl's integrodifferential vector equation, for which an analytical solution is obtained. V.L.

A92-10850
CALCULATION OF THE HARDENING FACTOR FOR GAS TURBINE ENGINE COMPONENTS SHOT BLASTED IN AN ULTRASONIC FIELD [RASCHET KOEFFITSIENTA UPROCHNENIIA DETALEI GTD SHARIKAMI V UL'TRAZVUKOVOM POLE]
V. K. IATSENKO (Zaporozhskii Mashinostroitel'nyi Institut, Zaporozhe, Ukrainian SSR) Problemy Prochnosti (ISSN 0556-171X), Aug. 1991, p. 78-81. In Russian. Aug. 1991 4 p In RUSSIAN refs
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Experimental data are presented on the fatigue strength of gas turbine engine components made of EP718 and VT8 alloy which have been hardened by shot blasting in an ultrasonic field. By using the similarity theory and dimensional analysis, a model of the hardening factor is obtained which makes it possible to select the optimum conditions of the hardening treatment in an ultrasonic field and improve the accuracy of the strength margin calculation at the stage of process design. V.L.

A92-10866
EFFECT OF THE MEAN CYCLE STRESS ON THE FATIGUE STRENGTH OF AN ORGANIC FIBER COMPOSITE [VLIIANIE SREDNEGO NAPRIAZHENIIA TSIKLA NA SOPROTIVLENIE USTALOSTI ORGANOPLASTIKA]
V. A. LIMONOV (Tsentral'nyi Nauchno-Issledovatel'skii Institut Spetsial'nogo Mashinostroeniia, Moscow, USSR) and IA. A. ANDERSON (Latviiskaia Akademiia Nauk, Institut Mekhaniki Polimerov, Riga, Latvia) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), May-June 1991, p. 421-429. In Russian. Jun. 1991 9 p In RUSSIAN refs
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Experimental fatigue curves are presented for a unidirectional organic fiber composite over a range of cycle stress ratios. Based on experimental data and layer-by-layer analysis of fatigue fracture, a method is developed for calculating the fatigue strength of organic fiber composites of arbitrary fiber orientations under different loading conditions. Calculated maximum cycle stresses for an organic fiber composite laminate are compared with the available experimental data. V.L.

A92-10867
EFFECT OF THE INTERACTION OF PARALLEL CRACKS IN COMPOSITES ON THE DISTRIBUTION OF THE DISTANCE BETWEEN CRACKS [VLIIANIE VZAIMODEISTVIIA PARALLEL'NYKH TRESHCHIN V KOMPOZITAKH NA RASPREDELENIE RASSTOIANIIA MEZHDU NIMI]
S. S. ABRAMCHUK and V. D. PROTASOV (Tsentral'nyi Nauchno-Issledovatel'skii Institut Spetsial'nogo Mashinostroeniia, Moscow, USSR) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), May-June 1991, p. 430-439. In Russian. Jun. 1991 10 p In RUSSIAN refs
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A relationship between the probability density of the distance between the nearest parallel cracks and their mean concentration is obtained theoretically assuming a constant noneffective length of the stressed state perturbation zone near the crack edge. For low concentration values, the probability density is shown to tend to a truncated exponential distribution. V.L.

A92-11888
ON THE APPROACH TO COMPUTING STIFFENED STRUCTURE NATURAL MODES
L. S. KURAVSKII and E. V. ARNAUTOV (Letno-Issledovatel'skii Institut, Zhukovski, USSR) Journal of Sound and Vibration (ISSN 0022-460X), vol. 150, Oct. 8, 1991, p. 161-166. 8 Oct. 1991 6 p refs
Copyright

This study presents a method of correction by elastic connection insertion (CECI) which is intended for determining the natural modes of thin-walled stiffened structures. The stiffener influence is described by special elastic and inertial operators which are added to the appropriate unstiffened structure operators in the free-vibration-problem formulation. The space of basis functions for the approximate solution is the set of shapes of natural modes of unstiffened structures. The CECI method reduces the original formulation to an algebraic eigenvalue problem, with a dimension determined by the number of basis functions used for the solution. The CECI method is found to be more economical than the FEM with regard to the computation time and memory size. The CECI method is also easier in programming. C.A.B.

A92-13764
CRACK PROPAGATION IN I BEAMS [RAZVITIE TRESHCHIN V DVUKHPOIASNYKH BALKAKH]
S. V. SHKARAEV, B. A. SERGEEV, and S. D. POZNYSHEV (Khar'kovskii Aviatsionnyi Institut, Kharkov, Ukrainian SSR) Fiziko-Khimicheskaia Mekhanika Materialov (ISSN 0430-6252), vol. 27, May-June 1991, p. 67-72. In Russian. Jun. 1991 6 p In RUSSIAN refs
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The finite element method is used to develop a detailed model describing the contact interaction between a fastener and the wall

of an I beam. The tear and transverse shear stress intensity factors are estimated by the superelement method for cracks in the vicinity of a fastening hole in the flange or at the flange-wall junction. The types of cracks occurring in I beams are identified. With reference to results obtained for V95 and D16 alloy beams, it is shown that the crack propagation mode is largely determined by the beam material. V.L.

A92-15024
FORCED OSCILLATIONS OF AN ELASTIC PLATE IN THE BOUNDED FLOW OF A COMPRESSIBLE FLUID [VYNUZHDENNYE KOLEBANIIA UPRUGOI PLASTINKI V OGRANICHENNOM POTOKE SZHIMAEMOI ZHIDKOSTI]
I. I. EFREMOV and E. I. NAUMOVA (Kievskii Politekhnicheskii Institut, Kiev, Ukrainian SSR) Bionika (ISSN 0374-6569), no. 24, 1991, p. 24-27. In Russian. 1991 4 p In RUSSIAN refs
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Aerodynamic forces arising during forced oscillations of an elastic plate in a bounded fluid are investigated using small-distance asymptotics, the technique which makes it possible to reduce the problem to a differential equation instead of an integral one. The eigenfrequencies of the elastic-plate oscillations are determined taking into account the effect of the compressible medium when the 'adjoined-mass' concept is no longer applicable. I.S.

A92-15041
PROBLEM OF THE EIGENVALUES AND EIGENMODES OF ROTATING DEFORMABLE STRUCTURES [PROBLEMA SOBSTVENNYKH ZNACHENII I FORM VRASHCHAIUSHCHIKHSIA DEFORMIRUEMYKH KONSTRUKTSII]
I. E. TROIANOVSKII, I. N. SHARDAKOV, and N. A. SHEVELEV Prikladnaia Matematika i Mekhanika (ISSN 0032-8235), vol. 55, Sept.-Oct. 1991, p. 857-864. In Russian. Oct. 1991 8 p In RUSSIAN refs
Copyright
An algorithm for the numerical solution of the problem of determining the natural frequencies and eigenmodes of rotating dynamically symmetric bodies is proposed which is based on the finite element method. To demonstrate the approach proposed here, it is applied to the problem of the stability of an aviation engine baffle. The instability regions are determined. V.L.

A92-16714
DETERMINATION OF THE DYNAMIC CHARACTERISTICS OF A LINEAR ELASTIC SYSTEM FROM THE CHARACTERISTICS OF A SYSTEM WITH MODIFIED PROPERTIES [OB OPREDELENII DINAMICHESKIKH KHARAKTERISTIK LINEINOI UPRUGOI SISTEMY PO KHARAKTERISTIKAM SISTEMY S IZMENENNYMI SVOISTVAMI]
V. R. AMINOV Akademiia Nauk SSSR, Izvestiia, Mekhanika Tverdogo Tela (ISSN 0572-3299), Sept.-Oct. 1991, p. 170-176. In Russian. Oct. 1991 7 p In RUSSIAN refs
Copyright
The paper is concerned with the problem of determining the dynamic characteristics of an elastic system from the known characteristics of a certain baseline system differing from the system of interest in inertial, stiffness, and dissipative properties. The convergence of the solution proposed in an earlier study (Aminov, 1986) is investigated using the longitudinal and transverse vibrations of a rod with a load at its end as an example. It is shown that the series in the characteristic equations converge at a faster rate when the initial system contains concentrated masses and stiffnesses. Practically important cases of changes in the dynamic properties of the structure that do not affect its natural modes are considered. V.L.

A92-16806
EFFECT OF DELAMINATIONS ON THE LOAD-CARRYING CAPACITY OF SANDWICH PLATES [VLIIANIE RASSLOENII NA NESUSHCHUIU SPOSOBNOST' TREKHSLOINYKH PLASTIN]
IU. V. SKVORTSOV and KH. S. KHAZANOV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 21-24. In Russian. 1990 4 p In RUSSIAN refs
Copyright
The deformation behavior of sandwich plates with a delamination-type defect is described in terms of a finite element model. The growth of the delamination is related to the energy release rate. The problem of determining the energy release rate distribution along the perimeter of a square delamination in a sandwich plate is solved using a modified crack closure method. V.L.

A92-18199
MATHEMATICAL PROBLEMS IN THE THEORY OF STRONGLY INHOMOGENEOUS ELASTIC MEDIA [MATEMATICHESKIE ZADACHI TEORII SIL'NO NEODNORODNYKH UPRUGIKH SRED]
OL'GA A. OLEINIK, GRIGORII A. IOSIF'IAN, and ALEKSEI S. SHAMAEV Moscow, Izdatel'stvo Moskovskogo Gosudarstvennogo Universiteta, 1990, 312 p. In Russian. 1990 312 p In RUSSIAN refs
Copyright
The book is concerned with mathematical problems in elasticity arising in the study of processes taking place in composite and perforated media. Particular attention is given to averaging problems for elasticity equations with rapidly oscillating coefficients in perforated regions with different boundary conditions and also to the determination of the effective characteristics. The discussion also cover the averaging of the natural frequencies of composites and perforated structures. V.L.

A92-18338
THEORY OF THE SMALL ELASTOPLASTIC DEFORMATIONS OF RANDOMLY REINFORCED COMPOSITE MATERIALS [K TEORII MALYKH UPRUGOPLASTICHESKIKH DEFORMATSII KHAOTICHESKI ARMIROVANNYKH KOMPOZITSIONNYKH MATERIALOV]
I. S. MAKAROVA and L. A. SARAEV PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (ISSN 0044-4626), Sept.-Oct. 1991, p. 120-124. In Russian. Oct. 1991 5 p In RUSSIAN refs
Copyright
The elastoplastic properties of a composite material containing nonoriented ellipsodial inclusions are investigated in the context of the mechanics of randomly inhomogeneous media. Expressions for calculating the elastoplastic properies of randomly reinforced composites are obtained and applied to a composite made of a sintered aluminum powder (14 percent Al2O3). The results are compared with experimental data. V.L.

A92-18347
ANALYSIS OF THE THERMOELASTIC STATE OF MULTILAYER SHELLS USING A RECTANGULAR SUPERELEMENT [K RASCHETU TERMOUPRUGOGO SOSTOIANIIA MNOGOSLOINYKH OBOLOCHEK NA OSNOVE CHETYREKHUGOL'NOGO SUPERELEMENTA]
O. A. BURAVTSOV and B. G. POPOV (Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Moscow, USSR) Prikladnaia Mekhanika (ISSN 0032-8243), vol. 27, Oct. 1991, p. 96-101. In Russian. Oct. 1991 6 p In RUSSIAN refs
Copyright
A family of rectangular shell elements of the mixed type are examined for which transverse shear is considered. Possible approximations of the strain field are analyzed, and it is concluded that the stiffness matrix of such elements does not have the required rank. A rectangular multilayer shell superelement is proposed whose stiffness matrix has the required rank. Calculation results are presented for a spherical multilayer panel subjected to combined thermal and force loading. V.L.

A92-21580
MULTIPOINT MOMENT DISTRIBUTION FUNCTIONS OF STRESSES AND STRAINS IN STOCHASTIC COMPOSITES [MNOGOTOCHECHNYE MOMENTNYE FUNKTSII RASPREDELENIIA DEFORMATSII I NAPRIAZHENII V STOKHASTICHESKIKH KOMPOZITAKH]
IU. V. SOKOLKIN (Permskii Politekhnicheskii Institut, Perm, USSR) and T. A. VOLKOVA (Ural'skii Politekhnicheskii Institut, Sverdlovsk, USSR) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), July-Aug. 1991, p. 662-669. In Russian. Aug. 1991 8 p In RUSSIAN refs
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A92-21634
MODELS OF ELASTIC MEDIA WITH STRESS RELAXATION [MODELI UPRUGIKH SRED S RELAKSATSIEI NAPRIAZHENII]
V. G. SUTYRIN Prikladnaia Matematika i Mekhanika (ISSN 0032-8235), vol. 55, Nov.-Dec. 1991, p. 996-1004. In Russian. Dec. 1991 9 p In RUSSIAN refs
Copyright
The stress relaxation process is described in relation to changes in the unstressed state tensor of the medium with time. Various possible types of thermodynamically justified relaxation equations are discussed. The asymptotic stability in the sense of Liapunov is considered. V.L.

A92-21678
AN APPROACH TO THE ANALYSIS OF SHELLS OF COMPLEX SHAPE [OB ODNOM PODKHODE K RASCHETU OBOLOCHEK SLOZHNOI FORMY]
M. N. SERAZUTDINOV and M. F. GARIFULLIN (Kamskii Politekhnicheskii Institut, Naberezhnye Chelny, USSR) Prikladnaia Mekhanika (ISSN 0032-8243), vol. 27, Nov. 1991, p. 48-54. In Russian. Nov. 1991 7 p In RUSSIAN refs
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A method for the analysis of shells of complex shape is proposed whereby all the principal relations are written in Cartesian coordinates and no data on shell curvature are used. Such an approach makes it possible to avoid the need for calculating the second-order derivatives of the radius vector of the shell middle surface. An algorithm for the parameterization of the middle surface is presented. Numerical results illustrating the accuracy of the approach are included. V.L.

A92-23570
PROBLEM OF THE SYNTHESIS OF SANDWICH SHELLS OF REVOLUTION FROM THE MECHANICAL AND RADIO ENGINEERING PARAMETERS [ZADACHA SINTEZA TREKHSLOINYKH OBOLOCHEK VRASHCHENIIA PO MEKHANICHESKIM I RADIOTEKHNICHESKIM PARAMETRAM]
A. D. PANTELEEV Akademiia Nauk SSSR, Izvestiia, Mekhanika Tverdogo Tela (ISSN 0572-3299), Nov.-Dec. 1991, p. 112-116. In Russian. Dec. 1991 5 p In RUSSIAN refs
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The paper is concerned with the problem of the optimal design of sandwich shells with allowance for mechanical and radio engineering requirements. The shell considered here is assumed to have layers of constant thickness made of composite or dielectric materials; it is irradiated by a plane linearly polarized electromagnetic wave and performs both as a radio engineering component and a load-bearing structure. An algorithm for solving the optimum design problem is developed which includes the computation of both mechanical and electrical shell characteristics. V.L.

A92-25308
CALCULATION OF AN ORTHOTROPIC SPHERICAL SHELL WITH TWO HOLES [RASCHET ORTOTROPNOI SFERICHESKOI OBOLOCHKI S DVUMIA OTVERSTIIAMI]
N. KH. NORALIEV and K. I. SHNERENKO (AN Ukrainy, Institut Mekhaniki, Kiev, Ukraine) Prikladnaia Mekhanika (ISSN 0032-8243), vol. 27, Dec. 1991, p. 45-51. In Russian. Dec. 1991 7 p In RUSSIAN refs
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The finite element method is applied to the stress-strain state problem for an orthotropic spherical shell with two round holes. The problem is solved within the framework of a refined Timoshenko model. A numerical example is presented for a shell with two unreinforced holes loaded by internal pressure. The effect of shear and material orthotropy on stress concentration is analyzed. V.L.

A92-25310
DISTRIBUTION OF SELF-BALANCED STRESSES IN COMPOSITE MATERIALS WITH WARPED CURVILINEAR-ANISOTROPIC LAYERS [RASPREDELENIE SAMOURAVNOVESHENNYKH NAPRIAZHENII V KOMPOZITNYKH MATERIALAKH S ISKRIVLENNYMI KRIVOLINEINO-ANIZOTROPNYMI SLOIAMI]
S. D. AKBAROV and S. M. MUSTAFAEV (AN Azerbaidzhana, Institut Matematiki i Mekhaniki, Baku, Azerbaijan) Prikladnaia Mekhanika (ISSN 0032-8243), vol. 27, Dec. 1991, p. 99-102. In Russian. Dec. 1991 4 p In RUSSIAN refs
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A92-25311
EFFECT OF MECHANICAL LAYER CHARACTERISTICS ON THE INTERNAL INSTABILITY OF A COMPOSITE [VLIIANIE MEKHANICHESKIKH KHARAKTERISTIK SLOEV NA VNUTRENNIUIU NEUSTOICHIVOST' KOMPOZITA]
I. A. GUZ' (AN Ukrainy, Institut Mekhaniki, Kiev, Ukraine) Prikladnaia Mekhanika (ISSN 0032-8243), vol. 27, Dec. 1991, p. 110-114. In Russian. Dec. 1991 5 p In RUSSIAN refs
Copyright
The effect of the mechanical characteristics of the filler and the matrix on the critical deformation of a layered composite is investigated in the context of three-dimensional nonaxisymmetric and plane problems. The analysis is carried out on the basis of the second version of the theory of small subcritical deformations in the three-dimensional linearized stability theory for deformable bodies. Expressions are presented which relate the critical deformation to each of the mechanical properties of the layers. V.L.

A92-27485
STRESS CONCENTRATION NEAR TWO UNEQUAL HOLES IN AN ORTHOTROPIC SPHERICAL SHELL [KONTSENTRATSIIA NAPRUZHEN' NAVKOLO DVOKH NERIVNIKH OTVORIV V ORTOTROPNII SFERICHNII OBOLONTSI]
K. I. SHNERENKO and N. KH. NORALIEV (AN Ukrainy, Institut Mekhaniki, Kiev, Ukraine) Akademiia Nauk Ukrains'koi RSR, Dopovidi, Matematika, Prirodoznavstvo, Tekhnichni Nauki (ISSN 0868-8052), April 1991, p. 48-52. In Ukrainian. Apr. 1991 5 p In UKRAINIAN refs
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A finite element approach is proposed for solving problems for orthotropic shells with several unequal holes on the basis of a refined Timoshenko theory. The region of interest is separated into quadratic rectangular isoparametric elements. A numerical example is presented for a spherical shell loaded by internal pressure. The effect of the hole radii and the distance between the hole centers on the stress concentration is investigated. V.L.

A92-30152
STABILITY OF STIFFENED PANELS WITH ALLOWANCE FOR PLASTICITY UNDER NONSTATIONARY HEATING AND LOADING [USTOICHIVOST' PODKREPLENNYKH PANELEI S UCHETOM PLASTICHNOSTI PRI NESTATSIONARNOM NAGREVE I NAGRUZHENII]
A. A. IONOV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 2, 1990, p. 101-110. In Russian. 1990 10 p In RUSSIAN refs
Copyright
A method and an algorithm are proposed for determining the critical buckling state of plates stiffened by elastic ribs under

nonstationary heating and loading with allowance for the plastic behavior of the material. The efficiency of the mathematical formalism and software developed here is demonstrated using theoretical and practical problems. V.L.

A92-30165
A SOLUTION FOR ELASTIC-PLASTIC PROBLEMS OF CONTACT INTERACTION BETWEEN BODIES USING THE FINITE-ELEMENT METHOD [RESHENIE UPRUGO-PLASTICHESKIKH ZADACH O KONTAKTNOM VZAIMODEISTVII TEL METODOM KONECHNYKH ELEMENTOV]
T. K. BEGEEV and V. I. GRISHIN TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 3, 1990, p. 88-94. In Russian. 1990 7 p In RUSSIAN refs
Copyright
A method is proposed for solving problems involving contact interaction between elastic-plastic bodies under arbitrary static load. In this method, the plasticity zones are determined using the deformation theory and an accelerated method of variable elasticity parameters. The solution method was implemented in the FITING computer program, and the results of computations are compared with experimental data. I.S.

A92-30170
DETERMINATION OF THE OBJECTIVE-FUNCTION GRADIENT IN THE PROBLEM OF MINIMIZING STRESS CONCENTRATION USING THE FINITE ELEMENT METHOD [OPREDELENIE GRADIENTA TSELEVOI FUNKTSII V ZADACHE O MINIMUME KONTSENTRATSII NAPRIAZHENII NA OSNOVE METODA KONECHNYKH ELEMENTOV]
V. I. GRISHIN and F. V. RYBAKOV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 3, 1990, p. 128-134. In Russian. 1990 7 p In RUSSIAN refs
Copyright
The paper examines the problem of optimizing the shape of an elastic body for the purpose of minimizig the stress concentration. Using implicit functions to represent the body contour, a method was developed for calculating the objective-function gradient from the body-shape parameters. The effect of the internal node position in the finite-element model on the accuracy of the gradient computations was investigated. Recommendations are proposed concerning the application of the method to solutions of practical problems. I.S.

A92-30177
INTEGRAL FINITE ELEMENTS - A NEW TYPE OF TWO-DIMENSIONAL HYBRID ELEMENTS BASED ON THE METHOD OF BOUNDARY INTEGRAL EQUATIONS [INTEGRAL'NYE KONECHNYE ELEMENTY - NOVAIA RAZNOVIDNOST' DVUMERNYKH GIBRIDNYKH ELEMENTOV, OSNOVANNAIA NA ISPOL'ZOVANII METODA GRANICHNYKH INTEGRAL'NYKH URAVNENII]
V. N. MAKSIMENKO, N. S. POGODINA, and V. D. CHUBAN' TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 4, 1990, p. 64-73. In Russian. 1990 10 p In RUSSIAN refs
Copyright
The paper considers a new type of 2D hybrid finite elements ('integral elements'), based on the derivation of internal stress/displacement fields by using the method of boundary equations. The new approach makes it possible to generate finite elements of complex internal structure (such as holes, cracks, or stiffeners) for anisotropic materials. These finite elements are proved to be compatible with known isoparametric finite elements used in the general displacement method. Thus, a stress concentration and mode-I/II stress intensity factors at a crack tip or a cut-out notch can be analyzed together with the general stress-strain state of a thin-walled airframe. As an example, an integral finite element is considered for calculating the stress state for an elliptic cut-out and a set of cracks and notches. I.S.

A92-30184
THE EFFECT OF INFREQUENT OVERLOAD CYCLES ON THE GROWTH OF A CRACK UNDER COMBINED EFFECTS OF FATIGUE AND CREEP [VLIIANIE REDKIKH TSIKLOV BOL'SHIKH NAGRUZOK NA ROST TRESHCHINY PRI SOCHETANII USTALOSTI I POLZUCHESTI]
S. I. OL'KIN TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 4, 1990, p. 109-113. In Russian. 1990 5 p In RUSSIAN refs
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The effect of infrequent periodic cycles of tensile loading on the growth of a crack under the combined action of fatigue and creep (i.e., the condition typical for the lower wing surface of a heavy supersonic aircraft) is investigated. It is found that, in the absence of creep, the infrequent periodic cycles of pure fatigue significantly change the crack growth rate, while the rate of crack growth is hardly affected under combined loads. It is shown that a method of estimating the crack growth resistance under combined loading, based on the linear summation of partial crack-growth rates, describes adequately the experimental results for both the regular loading conditions and for infrequently applied load cycles if the fatigue crack growth rate is evaluated without taking into account infrequent cyclic loads. I.S.

A92-30194
USING A SEMIANALYTICAL FINITE ELEMENT METHOD FOR SOLVING THE CONTACT PROBLEM FOR AXISYMMETRIC BODIES [PRIMENENIE POLUANALITICHESKOGO METODA KONECHNYKH ELEMENTOV K RESHENIIU KONTAKTNOI ZADACHI DLIA OSESIMMETRICHNYKH TEL]
L. P. ZHELEZNOV and A. E. KOLMAGOROV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 5, 1990, p. 102-111. In Russian. 1990 10 p In RUSSIAN refs
Copyright
The paper is concerned with the elastic contact problem for two axisymmetric bodies under nonaxisymmetric loading. The initial three-dimensional problem is reduced to a set of two-dimensional problems by using a semianalytical finite element method which combines two-dimensional discretization beyond circular finite elements and Fourier series expansions along the circular coordinate. For the case of contact discontinuity at a section of the node circumference, an algorithm is developed which is based on the method of successive approximations. Results of calculations for the three-dimensional case are presented. V.L.

A92-30208
EFFECT OF SHOCK WAVES ON THE CRITICAL RATE OF BENDING-TORSIONAL FLUTTER OF AN AIRFOIL [VLIIANIE SKACHKOV UPLOTNENIIA NA KRITICHESKUIU SKOROST' IZGIBNO-KRUTIL'NOGO FLATTERA AERODINAMICHESKOGO PROFILIA]
A. V. SAFRONOV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 6, 1990, p. 90-97. In Russian. 1990 8 p In RUSSIAN refs
Copyright
An analytical approximation is presented for the critical dynamic pressure of the bending-torsional flutter of a thin airfoil in a transonic flow with shock waves. It is shown that in this case the critical dynamic pressure can be much less than in the case of shock-free flow. L.M.

A92-31858
REDUCTION OF COMPUTATIONAL MODELS IN STRENGTH PROBLEMS [REDUTSIROVANIE RASCHETNYKH MODELEI V ZADACHAKH PROCHNOSTI]
D. D. EVSEEV, E. K. LIPIN, and V. V. CHEDRIK TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 1, 1991, p. 61-71. In Russian. 1991 11 p In RUSSIAN refs
Copyright
A method is proposed for reducing discrete finite element models for thin-walled structures to discrete-continuous computational models for strength problems. The method is based on the reduction of the stiffness matrix of a discrete structure

model by using a transition matrix obtained during the derivation of the node displacement vector from the specified forms of displacements of the discrete-continuous model. The efficiency of the approach is demonstrated for the reduction of the stiffness matrix of a finite element model of a wing structure to generalized stiffness matrices of a structurally anisotropic plate and a set of such plates. V.L.

A92-31895
A METHOD FOR THE STRENGTH ANALYSIS OF COMPOSITE STRUCTURES [METODIKA POVEROCHNYKH RASCHETOV PROCHNOSTI KONSTRUKTSII IZ KOMPOZITSIONNYKH MATERIALOV]
V. D. GRIGOR'EV, A. S. DZIUBA, A. A. IONOV, IU. A. KAMYSHOV, and V. F. KUT'INOV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 3, 1991, p. 81-91. In Russian. 1991 11 p In RUSSIAN refs
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A method for analyzing the stress-strain state and strength of composite structures is proposed which employs multilevel highly accurate finite element models of typical areas of the structures. The models allow for the design characteristics, type, and anisotropic properties of the structural elements and for the presence of manufacturing defects, with a correction for experimental data. As an example, the method is applied to the strength analysis of the large doors of a freight compartment, and good agreement is obtained with experimental data. V.L.

A92-31981
ANALYTICAL AND EXPERIMENTAL STUDY OF THE FATIGUE STRENGTH OF MATERIALS UNDER PLANE STRESS WITH ALLOWANCE FOR STRESS CONCENTRATION [RASCHET I EKSPERIMENTAL'NOE ISSLEDOVANIE SOPROTIVLENIIA USTALOSTI MATERIALA PRI PLOSKOM NAPRIAZHENNOM SOSTOIANII S UCHETOM KONTSENTRATSII NAPRIAZHENII]
P. A. PAVLOV, A. I. BOROVKOV, B. E. MEL'NIKOV, and M. A. MOCHALOV (Sankt-Peterburgskii Politekhnicheskii Institut, St. Petersburg, Russia) Problemy Prochnosti (ISSN 0556-171X), no. 1, 1992, p. 3-7. In Russian. 1992 5 p In RUSSIAN refs
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A92-33728
ELASTOPLASTIC STATE OF AXISYMMETRICALLY LOADED LAYERED BODIES OF REVOLUTION MADE OF ISOTROPIC AND ORTHOTROPIC MATERIALS [UPRUGOPLASTICHESKOE SOSTOIANIE OSESIMMETRICHNO NAGRUZHENNYKH SLOISTYKH TEL VRASHCHENIIA IZ IZOTROPNYKH I ORTOTROPNYKH MATERIALOV]
IU. N. SHEVCHENKO, V. V. PISKUN, and V. A. KOVALENKO (AN Ukrainy, Institut Mekhaniki, Kiev, Ukraine) Prikladnaia Mekhanika (ISSN 0032-8243), vol. 28, Jan. 1992, p. 31-39. In Russian. Jan. 1992 9 p In RUSSIAN refs
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An algorithm and a finite element method are proposed for solving the stress-strain problem for structural elements in the form of multilayer bodies of revolution exposed to axisymmetric thermal and mechanical loading. The individual layers (or parts) of the bodies may consist of isotropic and orthotropic materials. The approach used here is an extension of previously developed numerical methods for solving thermoplasticity problems for isotropic bodies of revolution and thermoelasticity problems for curvilinear orthotropic bodies of revolution of arbitrary meridional cross section. The study is relevant to the development of joints for structures including composite elements. V.L.

A92-33768
CHARACTERISTICS OF THE THERMAL STRESS STATE IN A THIN LAYER AROUND AN INCLUSION IN A FULL-STRENGTH COMPOSITE [OSOBENNOST' TERMONAPRIAZHENNOGO SOSTOIANIIA V TONKOM SLOE VOKRUG VKLIUCHENIIA V RAVNOPROCHNOM KOMPOZITE]
V. S. KIRILIUK (AN Ukrainy, Institut Mekhaniki, Kiev, Ukraine) Prikladnaia Mekhanika (ISSN 0032-8243), vol. 28, Feb. 1992, p. 75-78. In Russian. Feb. 1992 4 p In RUSSIAN refs
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A92-36419
NUMERICAL MODELING OF THE SHOCK COMPRESSION OF A MICROPORE IN A THERMOELASTIC-VISCOPLASTIC MATERIAL [CHISLENNOE ISSLEDOVANIE UDARNOGO SZHATIIA MIKROPORY V TERMOUPRUGOVIAZKOPLASTICHESKOM MATERIALE]
A. B. KISELEV and M. V. IUMASHEV Moskovskii Universitet, Vestnik, Seriia 1 - Matematika, Mekhanika (ISSN 0579-9368), no. 1, Jan.-Feb. 1992, p. 78-83. In Russian. Feb. 1992 6 p In RUSSIAN refs
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The shock compression of void and gas-filled spherical micropores in a thermoelastic-viscoplastic material is investigated numerically. In particular, calculations are made for a solid propellant using an explicit finite difference scheme on a Lagrange grid. An improved kinetic equation is obtained which allows for the pressure of the gas against the inner wall of the micropore. V.L.

A92-36611
NONSTATIONARY AEROHYDROELASTICITY OF SPHERICAL BODIES [NESTATSIONARNAIA AEROGIDROUPRUGOST' TEL SFERICHESKOI FORMY]
ANATOLII G. GORSHKOV and DMITRII V. TARLAKOVSKII (Moskovskii Aviatsionnyi Institut, Moscow, Russia) Moscow, Izdatel'stvo Nauka, 1990, 264 p. In Russian. 1990 264 p In RUSSIAN refs
(ISBN 5-02-014006-6) Copyright

Results of systematic studies of the nonstationary interaction of spherical thin-walled and solid deformable bodies (layers) with elastic and acoustic media are reported. For the case of spherical (plane) shock wave diffraction by deformable obstacles submerged in an elastic (acoustic) medium, a series of exact solutions is obtained using the theory of generalized spherical waves and integral transformation methods. In problems involving impact and submersion of rigid and elastic spherical bodies (shells) in a half-space filled with an ideal fluid, current numerical methods are used in addition to analytical methods. V.L.

A92-38432
BUCKLING AND STABILITY OF POLYMERIC COMPOSITE BEAMS UNDER STOCHASTIC EXCITATION
VADIM D. POTAPOV and ALEXANDR I. MARASANOV (Railway Engineering Institute, Moscow, Russia) (Gesellschaft fuer angewandte Mathematik und Mechanik, Wissenschaftliche Jahrestagung, Krakow, Poland, Apr. 1-5, 1991, Vortraege. A92-38426 15-39) Zeitschrift fuer angewandte Mathematik und Mechanik (ISSN 0044-2267), vol. 72, no. 4, 1992, p. T 97-T 100. 1992 4 p refs
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An initial bending beam made of a composite viscoelastic orthotropic material is studied. The deformation of the beam compressed by a longitudinal force in the form of a stationary random process is performed using the method of statistical simulation. C.D.

A92-40704
NEW GENERALIZED INTEGRAL TRANSFORMS IN AXIALLY SYMMETRIC BOUNDARY VALUE PROBLEMS IN COMPOSITE MECHANICS [NOVYE OBOBSHCHENNYE INTEGRAL'NYE PREOBRAZOVANIIA V OSESIMMETRICHNYKH KRAEVYKH ZADACHAKH MEKHANIKI KOMPOZITOV]
A. L. KALAMKAROV, B. A. KUDRIAVTSEV (Moskovskii Institut Khimicheskogo Mashinostroeniia, Moscow, Russia), and D. BARDZOKAS (Athens, National Technical University, Greece) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), no. 6, Nov.-Dec. 1991, p. 1005-1014. In Russian. Dec. 1991 10 p In RUSSIAN refs
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An analytical method to solve axially symmetric problems in composite mechanics is proposed. Integral transforms and expansions which generalize the Fourier-Bessel series, Hankel and Weber-Orr transforms are used to obtain analytical solutions to boundary-value problems for composite multilayer shells of finite length and for axially symmetric composite layers with or without circular holes. O.G.

A92-40747
PERIODIC COMBINED BOUNDARY VALUE PROBLEMS AND THEIR APPLICATIONS IN THE THEORY OF ELASTICITY [PERIODICHESKIE KOMBINIROVANNYE KRAEVYE ZADACHI I IKH PRILOZHENIIA V TEORII UPRUGOSTI]
E. L. NAKHMEIN and B. M. NULLER Prikladnaia Matematika i Mekhanika (ISSN 0032-8235), vol. 56, no. 1, Jan.-Feb. 1992, p. 95-104. In Russian. Feb. 1992 10 p In RUSSIAN refs
Copyright
The periodic problems considered here are mixed static and stationary dynamic elasticity problems for isotropic and orthotropic half-planes and a composite plane. The problems can be reduced to Hilbert-Riemann problems and solved in quadratures. A problem concerning the interaction between a periodic system of punches and an elastic half-plane is analyzed as an example. V.L.

A92-40936
PROBLEMS OF NONLINEAR DEFORMATION
E. I. GRIGOLIUK (Moscow Auto-Mechanical Institute, Russia) and V. I. SHALASHILIN (Moscow Aviation Institute, Russia) Dordrecht, Netherlands, Kluwer Academic Publishers, 1991, 269 p. Translation. 1991 269 p refs
(ISBN 0-7923-0947-2) Copyright
A method of continuing the solution is discussed with respect to a parameter for a certain class of nonlinear problems in solid mechanics. Modifications of the method are developed in order to implement a unified continuation process at regular and limit points in the set of solutions, with extensions to nonlinear boundary value problems. Algorithms are developed for solving large deflection problems of elastic arches and large axisymmetric deflection problems for shells of revolution. In particular, the algorithms are used for the analysis of large deflections of circular arches and toroidal shells. Examples of natural vibration and stability problems for parallelograms and trapezoidal membranes and panels are given. C.D.

A92-42651
AN EFFECTIVE ALGORITHM FOR CALCULATING THE CREEP STRUCTURAL ELEMENTS BASED ON THE FINITE ELEMENT METHOD [EFFEKTIVNYI ALGORITM RASCHETA ELEMENTOV KONSTRUKTSII NA POLZUCHEST' V RAMKAKH METODA KONECHNYKH ELEMENTOV]
K. N. RUDAKOV (Kievskii Politekhnicheskii Institut, Kiev, Ukraine) Problemy Prochnosti (ISSN 0556-171X), no. 4, 1992, p. 8-13. In Russian. 1992 6 p In RUSSIAN refs
Copyright
The method of initial deformations has been modified using a sufficiently general kind of equation for the material state under creep. The algorithm takes into account the temperature effect on the elastic properties of the material accurately and noniteratively based on the finite element calculations of structural elements. The effect of a mean normal strain on the equation of state under creep is also considered. O.G.

A92-42653
TECHNIQUE FOR ESTIMATING THE STRENGTH OF GAS TURBINE GUIDE VANES WITH STRESS RAISERS [METODIKA OTSENKI PROCHNOSTI NAPRAVLIAIUSHCHIKH APPARATOV GAZOVYKH TURBIN S KONTSENTRATORAMI]
A. R. BELIAKOV, L. B. GETSOV, K. M. KONONOV, V. K. TUTYNIN, and A. S. PREOBRAZHENSKII (Ob'edinenie Proletarskii Zavod, St. Petersburg, Russia) Problemy Prochnosti (ISSN 0556-171X), no. 4, 1992, p. 37-44. In Russian. 1992 8 p In RUSSIAN refs
Copyright
A technique for calculating the safety factor of gas turbine guide vanes which takes into account stress concentrations is presented. The technique is based on the theory of adaptability and experimentally determined stress concentration factors. Results obtained for KhN60VT alloy, a commonly used guide vane ring casing material, are presented as an example. O.G.

A92-42654
POSSIBILITY OF INCREASING DURABILITY OF BLADES WITH DAMAGES [O VOZMOZHNOSTI POVYSHENIIA DOLGOVECHNOSTI LOPATOK S POVREZHDENIIAMI]
V. A. BOGUSLAEV (Proizvodstvennoe Ob'edinenie Motorostroitel', Zaporozhe, Ukraine) Problemy Prochnosti (ISSN 0556-171X), no. 4, 1992, p. 45-49. In Russian. 1992 5 p In RUSSIAN refs
Copyright
The efficiency of a hardening method for titanium alloy gas-turbine compressor blades has been studied. It is shown that the hardening method is capable of increasing the durability of damaged blades by more than a factor of two. Cracks in these blades occur in a narrower zone and mainly on the side of the leading edge as compared with nonhardened blades. O.G.

A92-42661
CALCULATION OF LOW-FREQUENCY OSCILLATIONS AND VIBRATIONAL HEATING OF A SEMIINFINITE VISCOELASTIC CYLINDER BY THE FINITE ELEMENT METHOD [K RASCHETU NIZKOCHASTOTNYKH KOLEBANII I VIBRORAZOGREVA POLUBESKONECHNOGO VIAZKOUPRUGOGO TSILINDRA MKE]
I. K. SENCHENKOV, V. I. KOZLOV, and S. N. IAKIMENKO (AN Ukrainy, Institut Mekhaniki, Kiev, Ukraine) Prikladnaia Mekhanika (ISSN 0032-8243), vol. 28, no. 4, April 1992, p. 3-7. In Russian. Apr. 1992 5 p In RUSSIAN refs
Copyright
Low-frequency oscillations and vibrational heating of a semiinfinite viscoelastic cylinder excited at its end are calculated using the finite element method. For the finite part of the region, a solution is obtained using an ordinary analytical procedure and, for the infinite part, a solution is obtained using a rod wave mode. O.G.

A92-42665
AN AERODYNAMIC HYPOTHESIS FOR THE WING AEROELASTICITY PROBLEM [OB ODNOI AERODINAMICHESKOI GIPOTEZE DLIA RESHENIIA ZADACH AEROUPRUGOSTI KRYLA]
I. I. EFREMOV (Kievskii Politekhnicheskii Institut, Kiev, Ukraine) Prikladnaia Mekhanika (ISSN 0032-8243), vol. 28, no. 4, April 1992, p. 63-70. In Russian. Apr. 1992 8 p In RUSSIAN refs
Copyright
The asymptotic theory is used to study wing oscillations near a plane screen. The discussion focuses on oscillations and stability of a thin freely supported plane in incompressible flow. It is shown that the plate is dynamically stable but statically loses balance at a certain value of flow velocity. O.G.

A92-42667
DETERMINATION OF EDGE EFFECT REGIONS IN LAYERED COMPOSITES IN THE PRESENCE OF FILLER DISCONTINUITIES [OPREDELENIE OBLASTEI KRAEVYKH EFFEKTOV V SLOISTYKH KOMPOZITAKH PRI NALICHII RAZRYVOV NAPOLNITELIA]
A. N. GUZ', IU. V. KOKHANENKO, and E. S. IAKOVLEVA (AN Ukrainy, Institut Mekhaniki, Kiev, Ukraine) Prikladnaia Mekhanika (ISSN 0032-8243), vol. 28, no. 3, March 1992, p. 14-19. In Russian. Mar. 1992 6 p In RUSSIAN refs
Copyright
The problem of determining edge effects in a layered composite material in the presence of two cracks in adjacent filler layers is analyzed in the context of three-dimensional linearized elasticity using a piecewise homogeneous model of a medium consisting of homogeneous contacting bodies. Particular attention is given to

integral characteristics, such as the extension of edge effects and the configuration of the edge effect region, which are determined by using the finite difference method. Edge effect regions are shown for certain ratios of the elastic moduli of the filler and the matrix. V.L.

A92-42756
PHASE-EQUILIBRIUM CONDITIONS IN NONLINEAR-ELASTIC MEDIA WITH MICROSTRUCTURE [USLOVIIA FAZOVOGO RAVNOVESIIA V NELINEINO-UPRUGIKH SREDAKH S MIKROSTRUKTUROI]
V. A. EREMEEV and L. M. ZUBOV (Rostovskii Gosudarstvennyi Universitet, Rostov-on-Don, Russia) Rossiiskaia Akademiia Nauk, Doklady (ISSN 0002-3264), vol. 322, no. 6, 1992, p. 1052-1056. In Russian. 1992 5 p In RUSSIAN refs
Copyright
Conditions are formulated for the thermodynamic phase equilibrium of elastic microinhomogeneous materials under finite deformations. The following generalized models of elastic media are considered: the Cosserat continuum, a medium with microdeformations, and a liquid crystal. These models can be used to describe the behavior of media with microstructure, including polycrystalline and granular materials, porous materials, composites, polymers, geophysical media, etc. L.M.

A92-42769
STATIONARY MOTION OF A SHALLOW ELASTIC SHELL IN CIRCULAR ORBIT [O STATSIONARNOM DVIZHENII POLOGOI SFERICHESKOI UPRUGOI OBOLOCHKI NA KRUGOVOI ORBITE]
I. I. KARPOV Rossiiskaia Akademiia Nauk, Izvestiia, Mekhanika Tverdogo Tela (ISSN 0572-3299), no. 1, Jan.-Feb. 1992, p. 119-124. In Russian. Feb. 1992 6 p In RUSSIAN refs
Copyright
A study is made of the effect of the elastic vibrations and internal damping of a large elastic structure on its motion as a whole relative to its center of mass. The structure is modeled by a shallow thin-walled elastic spherical shell moving in a central Newtonian gravitational field in circular orbit. The equations of motion are derived using modal analysis. The existence of the stationary rotation of the shell about its axis of symmetry normal to the orbit plane is demonstrated. The stability of this rotation in the quasi-static regime is analyzed, and it is shown that internal damping leads to a qualitative change in the nature of stability. V.L.

A92-42772
STABILIZING EFFECT OF GEOMETRICAL AND STIFFNESS PARAMETERS ON THE FLUTTER OF PANELS WITH CONCENTRATED MASSES IN SUPERSONIC FLOW [O STABILIZIRUIUSHCHEM VLIIANII GEOMETRICHESKIKH I ZHESTKOSTNYKH PARAMETROV NA FLATTER PANELEI S SOSREDOTOCHENNYMI MASSAMI V SVERKHZVUKOVOM POTOKE]
L. M. ZORII and N. I. SOROKATYI Rossiiskaia Akademiia Nauk, Izvestiia, Mekhanika Tverdogo Tela (ISSN 0572-3299), no. 1, Jan.-Feb. 1992, p. 144-152. In Russian. Feb. 1992 9 p In RUSSIAN refs
Copyright
Elastic systems with a finite number of degrees of freedom and distributed parameters are investigated by the method of characteristic series with reference to the panel flutter problem. A method for the derivation of characteristic equations is presented, and new qualitative results are obtained. It is shown that, in certain cases, a change in the direction of flow around a panel with elastically suspended masses has no effect on the vibration frequency and critical velocity. Conditions are determined under which there is practically no stability loss in the case of a panel with one or two oscillators. Efficient methods for the numerical analysis of this type of problems are developed. V.L.

A92-44110
THE BRITTLE FRACTURE CHARACTERISTICS OF DISPERSELY FILLED COMPOSITES UNDER DIFFERENT ADHESIVE CONDITIONS [ZAKONOMERNOSTI KHRUPKOGO RAZRUSHENIIA DISPERSNO-NAPOLNENNYKH KOMPOZITOV V RAZLICHNYKH USLOVIIAKH ADGEZIONNOI SVIAZANNOSTI]
V. G. OSHMIAN (Rossiiskaia Akademiia Nauk, Institut Khimicheskoi Fiziki, Moscow, Russia) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), no. 1, Jan.-Feb. 1992, p. 34-42. In Russian. Feb. 1992 9 p In RUSSIAN refs
Copyright
Mechanisms of interface debonding and fracture in composite materials are analyzed using the energy criterion of crack propagation in the elastic media. It is found that, for ideal bonds, the composite strength increases with the filling due to the increasing rigidity and surface deformation. For low adhesive strengths, the composite strength decreases due to reduction of elastic moduli and fracture surfaces. When the adhesive fracture accompanies the crack propagation and occurs in the front points or in their vicinity, the composite strength increases with the filling. For certain ratios of adhesive/cohesive fracture parameters, composite strength values can exceed the values associated with ideal bonds. O.G.

A92-44111
FRACTURE OF COMPOSITE MATERIALS AT HIGH TEMPERATURES AND UNDER FINITE STRAINS [RAZRUSHENIE KOMPOZITNYKH MATERIALOV PRI VYSOKIKH TEMPERATURAKH I KONECHNYKH DEFORMATSIIAKH]
IU. I. DIMITRIENKO (NPO Mashinostroeniia, Reutovo, Russia) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), no. 1, Jan.-Feb. 1992, p. 43-54. In Russian. Feb. 1992 12 p In RUSSIAN refs
Copyright
A model is developed to study elastomer porous composite materials under large strains and at high temperatures. The model makes it possible to describe finite deformations, damage and thermomechanical destruction, coking shrinkage, heat and mass transfer, and gas filtration in pores of composites. The model is described by a system of integral-differential equations. A cylindrical heat-resistant shell made of an elastomer composite in internal high-temperature gas flow is analyzed using the proposed model. Results indicate that finite strains substantially affect heat-mass transfer, filtration, and thermomechanical surface destruction of the composite material. O.G.

A92-44112
DETERMINATION OF THE SHORT-TERM MACROSTRENGTH AND FRACTURE TOUGHNESS OF ORTHOTROPIC COMPOSITE MATERIALS IN A COMPLEX STRESS STATE [OPREDELENIE KRATKOVREMENNOI MAKROPROCHNOSTI I TRESHCHINOSTOIKOSTI ORTOTROPNYKH KOMPOZITNYKH MATERIALOV PRI SLOZHNOM NAPRIAZHENNOM SOSTOIANII]
M. V. DELIAVSKII, L. T. BEREZHNITSKII, and L. I. ONYSHKO (AN Ukrainy, Fiziko-Mekhanicheskii Institut, Lvov, Ukraine) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), no. 1, Jan.-Feb. 1992, p. 55-66. In Russian. Feb. 1992 12 p In RUSSIAN refs
Copyright
Techniques are presented to determine structural characteristics of fracture toughness and anisotropy of orthotropic composite materials. These techniques include calculation of the stress field in biaxial tensile shear of a unidirectional composite; determination of specimen dimensions for stress field uniformity; experimental determination of the ultimate load value; and the method of least squares. The fracture toughness of a continuous anisotropic specimen is calculated using equations for a continuous rectangular orthotropic plate and an infinite plate with a crack under compensated loads, which are based on Green functions. Calibrated curves describe the dependence of the stress intensity

factor on the notch length of the specimen. A structural fracture criterion is proposed for an orthotropic composite material with a crack. O.G.

A92-46547
THE STRESS-STRAIN STATE OF BODIES OF REVOLUTION OF COMPLEX SHAPE UNDER A NONSTATIONARY TEMPERATURE EFFECT [O NAPRIAZHENNO-DEFORMIROVANNOM SOSTOIANII TEL VRASHCHENIIA SLOZHNOI FORMY PRI NESTATSIONARNOM TEMPERATURNOM VOZDEISTVII]
K. B. BULYGA, B. M. LISITSYN, and O. G. MARTYNIUK (Kievskii Inzhenerno-Stroitel'nyi Institut, Kiev, Ukraine) Prikladnaia Mekhanika (ISSN 0032-8243), vol. 28, no. 5, May 1992, p. 48-52. In Russian. May 1992 5 p In RUSSIAN refs
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A92-46605
MODELING THE CONDITION OF PLANAR SECTIONS USING THE FINITE ELEMENT METHOD [MODELIROVANIE USLOVIIA PLOSKIKH SECHENII V MKE]
B. Z. MARGOLIN and V. I. KOSTYLEV (TsNII Konstruktsionnykh Materialov 'Prometei', St. Petersburg, Russia) Problemy Prochnosti (ISSN 0556-171X), no. 5, 1992, p. 35-38. In Russian. 1992 4 p In RUSSIAN refs
Copyright
An approach is developed which makes it possible to simulate the condition of planar sections when solving two-dimensional elastoplastic problems by the finite element method. The method can be applied to structures containing regular segments or constant geometry in a given direction, loaded by a periodically changing system of some perturbing factors (such as power, temperature, or initial strains). I.S.

A92-46613
THERMOELASTICITY AND THERMOVISCOELASTICITY OF TUBULAR LAMINATED RODS MADE OF COMPOSITES [TERMOUPRUGOST' I TERMOVIAZKOUPRUGOST' TRUBCHATYKH SLOISTYKH STERZHNEI IZ KOMPOZITOV]
V. M. PESTRENIN, I. V. PESTRENINA, and A. F. MERZLIAKOV (Permskii Gosudarstvennyi Universitet, Perm, Russia) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), no. 2, Mar.-Apr. 1992, p. 179-187. In Russian. Apr. 1992 9 p In RUSSIAN refs
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Thermoelasticity and thermoviscoelasticity equations are constructed for tubular laminated rods on the basis of the hypothesis of flat sections and the nondeformability of the cross section in its plane. Formulas for calculating effective macroscopic parameters and functions found in such equations depend on the thermomechanical characteristics of separate layers and the respective structural parameters. The notion of effective parameters and functions of the thermal deformation of the rod is introduced, and its physical sense is identified. The hardness matrix of the tubular laminated rod is plotted as a structural element. The example of the flat rod system illustrates the particular features of its deformations during thermal loading. P.D.

A92-46618
AN EXPERIMENTAL/THEORETICAL METHOD FOR THE STUDY OF THE RESIDUAL TECHNOLOGICAL STRESSES IN PRODUCTS MADE OF COMPOSITE MATERIALS [EKSPERIMENTAL'NO-TEORETICHESKII METOD ISSLEDOVANIIA OSTATOCHNYKH TEKHNOLOGICHESKIKH NAPRIAZHENII V IZDELIIAKH IZ KOMPOZITNYKH MATERIALOV]
G. V. VORONTSOV and A. I. REZNICHENKO (Novocherkasskii Politekhnicheskii Institut, Novocherkassk, Russia) Mekhanika Kompozitnykh Materialov (ISSN 0203-1272), no. 2, Mar.-Apr. 1992, p. 239-246. In Russian. Apr. 1992 8 p In RUSSIAN refs
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A method for analyzing residual stresses in products made of composite materials by forced winding, pyrolytic precipitation, casting or extrusion is proposed. It is shown that each initial stressed state of a product may have an equivalent temperature field causing identical thermoelastic stresses in the product. This method is verified by means of analysis of the technological stresses in thick-walled conic shells made by pyrolytic carbon precipitation at temperatures above 2000 C. The method makes it possible to determine the stresses of the whole volume of the product with comparatively few data on the deformation relaxation provided by the attached strain gauges. Satisfactory agreement was found between the theoretical and experimental values of the stresses in places of the fixed strain gauges. P.D.

A92-49173
A FINITE ELEMENT STUDY OF THE STABILITY OF A REINFORCING RIB OF COMPLEX SHAPE [OB ISSLEDOVANII USTOICHIVOSTI PODKREPLIAIUSHCHEGO REBRA SLOZHNOI FORMY S POMOSHCH'IU MKE]
V. V. ZBOROVSKII, V. I. KRAVETS, V. I. MIN'KOVICH, I. Z. STEPANENKO, and N. N. STOIAN (Kievskii Gosudarstvennyi Universitet, Kiev, Ukraine) Vychislitel'naia i Prikladnaia Matematika (ISSN 0321-4117), no. 66, 1988, p. 60-70. In Russian. 1988 11 p In RUSSIAN refs
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The local buckling of a plate-reinforcing rib of complex configuration is investigated by using the finite element method. Elastic and geometrical stiffness matrices are obtained. The critical buckling stresses are determined by solving an eigenvalue problem. V.L.

A92-53887
APPLICATION OF THE GENERAL PROBLEM OF MOMENTS TO SOME OPTIMIZATION PROBLEMS IN ELASTICITY THEORY [O PRIMENENII OBSHCHEI PROBLEMY MOMENTOV K NEKOTORYM OPTIMIZATSIONNYM ZADACHAM TEORII UPRUGOSTI]
E. I. GRIGOLIUK, V. A. FIL'SHTINSKII, and L. A. FIL'SHTINSKII Rossiiskaia Akademiia Nauk, Izvestiia, Mekhanika Tverdogo Tela (ISSN 0572-3299), no. 2, Mar.-Apr. 1992, p. 31-37. In Russian. Apr. 1992 7 p In RUSSIAN refs
Copyright
Several optimization problems in elasticity theory are formulated which are relevant to geomechanics. Methods are then presented for reducing these problems to general moment problems in continuous-function space. By using polynomial approximations of nonstandard moment functions, the general moment problems are reduced to the classical power-law moment problem. This allows an a priori evaluation of the optimal control structure. Theoretical and computational examples are presented. V.L.

A92-53889
TANGENTIAL STRESS DISTRIBUTION DURING THE BENDING OF AN ORTHOTROPIC STRIP [O RASPREDELENII KASATEL'NYKH NAPRIAZHENII PRI IZGIBE ORTOTROPNOI POLOSY]
L. A. SHAPOVALOV Rossiiskaia Akademiia Nauk, Izvestiia, Mekhanika Tverdogo Tela (ISSN 0572-3299), no. 2, Mar.-Apr. 1992, p. 143-150. In Russian. Apr. 1992 8 p In RUSSIAN refs
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Transverse strain and stress distribution in an orthotropic strip during bending is determined on the basis of an exact solution of the bending problem and also from an approximate solution for the cubic law of longitudinal displacement change. For both cases, the tangential stresses in the thickness direction are shown to remain constant in materials with a vanishing shear modulus. The parabolic distribution is realized only for the limiting case of infinitely large shear moduli. This result is consistent with the classical theory of beam bending based on the hypothesis of a straight normal. V.L.

A92-54252
ON THE DEPENDENCE OF THE VELOCITY OF ELASTIC WAVES IN COMPOSITE MEDIA ON INITIAL STRESSES
A. G. KOLPAKOV (WCCM II - World Congress of Computational Mechanics, 2nd, Universitaet Stuttgart, Germany, Aug. 27-31, 1990,

Selected Papers. A92-54242 23-39) Computers & Structures (ISSN 0045-7949), vol. 44, no. 1-2, July 3, 1992, p. 97-101. 3 Jul. 1992 5 p refs
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Theoretical issues related to composite structures are examined as they pertain to the dependence of material mechanical characteristics on initial stresses. Attention is given to the replacement of a nonhomogeneous body with a homogeneous body by means of G-convergence. The deformation of composite bodies having initial stresses can be homogenized at the initial statement only and not at any intermediate stage. Analyzing the dependence of the homogenized coefficients on mean stresses requires a solution of the cellular problem with consideration given to periodicity and real geometrical features of composite media. These issues are explored for example cases such as: laminated bodies, highly porous media, and laminated media with initial stresses. The dependence of the velocity of elastic waves in nonhomogeneous bodies is shown to differ quantitatively and qualitatively from homogeneous bodies. C.C.S.

A92-54273
A NUMERICAL ANALYSIS OF THE RUPTURE OF POWDER MATERIALS UNDER THE POWER IMPACT INFLUENCE
A. VAKHRUSHEV (Russian Academy of Sciences, Institute of Mathematics and Mechanics, Izhevsk, Russia) and A. LIPANOV (Russian Academy of Sciences, Physico-Technical Institute, Izhevsk, Russia) (WCCM II - World Congress of Computational Mechanics, 2nd, Universitaet Stuttgart, Germany, Aug. 27-31, 1990, Selected Papers. A92-54242 23-39) Computers & Structures (ISSN 0045-7949), vol. 44, no. 1-2, July 3, 1992, p. 481-486. 3 Jul. 1992 6 p refs
Copyright

An analytical technique is employed to study the dynamical rupture of powder materials at normal and high temperatures due to power impacts. The thermoplastic model incorporates expressions for the inhomogeneity and anisotropy of the material properties and temperature dependence. The finite-element formulation utilizes strain-displacement expressions and variables for elastic, plastic, rheological, temperature, and 'phase' deformations. The formulation is applied to the study of dispersion processes of axisymmetrical particles for six load configurations. The results give the forms, sizes, and number of ultradispersional particles as well as the basic parameters of the kinetics of these processes. The present finite-element formulation is of interest to the study of the dynamical processes of the rupture of powder materials under power-impact influences. C.C.S.

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GEOSCIENCES (GENERAL)

A92-18200
OPTICAL CONDITIONS OF NATURAL WATERS AND REMOTE SENSING OF PHYTOPLANKTON [OPTICHESKIE SVOISTVA PRIRODNYKH VOD I DISTANTSIONNOE ZONDIROVANIE FITOPLANKTONA]
KIRILL IA. KONDRAT'EV and DMITRII V. POZDNIAKOV Leningrad, Izdatels'tvo Nauka, 1988, 184 p. In Russian. . 1988 184 p In RUSSIAN refs
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Problems encountered in remote optical sensing (ROS) of anthropogenic eutrophication of inner water bodies are discussed, and the physical, hydrochemical, and hydrobiological mechanisms responsible for the formation of specific optical properties of water in inland reservoirs are examined together with causes of their spatial variability. Particular attention is given to the methods used in remote measurements of phytoplankton in lake waters, and results are given on phytoplankton growth in Lake Ladoga, Lake Onega, Lake Sevan, and the Mingechaursk water reservoir. The feasibility of monitoring the condition of lake waters using satellite observations is discussed. I.S.

A92-36401
THE ECOS-A PROJECT - SCIENTIFIC SPACE INVESTIGATIONS AND MODELING OF GLOBAL ECOLOGICAL AND CLIMATIC PROCESSES AND NATURAL DISASTERS [PROEKT 'EKOS-A' - NAUCHNYE KOSMICHESKIE ISSLEDOVANIIA I POSTROENIE MODELEI GLOBAL'NYKH EKOLOGICHESKIKH I KLIMATICHESKIKH PROTSESSOV I PRIRODNYKH KRIZISNYKH SITUATSII]
G. A. AVANESOV, A. A. GALEEV, B. S. ZHUKOV, IA. L. ZIMAN, and I. G. MITROFANOV (Rossiiskaia Akademiia Nauk, Institut Kosmicheskikh Issledovanii, Moscow, Russia) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), no. 2, Mar.-Apr. 1992, p. 3-14. In Russian. Apr. 1992 12 p In RUSSIAN refs
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The concept of the ECOS-A project is outlined. Consideration is given to the basic areas of research, requirements for space-based and concomitant ground observations, the composition and specifications of onboard instrumentation, and the performance data of spacecraft and ground support systems. The interconnection of ECOS-A research fields is illustrated, and a diagram of ECOS-A space-based observations is given. P.D.

A92-57354
ECONOMICS AND ECOLOGY OF SPACE COMMERCIAL ACTIVITY
NATALIA E. TABACHNAIA (Moscow Aviation Institute, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. Aug. 1992 10 p refs
(IAF PAPER ST-92-0003) Copyright

The paper considers economic and ecological aspects of space activity in correlation. Systematization of various ecological effects, scenario approach for space debris pollution, and complex of environment-oriented measures are presented. Principles and tasks for economic evaluation of ecological factors and specific techniques are discussed, particularly for the problems of space activity in the Commonwealth of Independent States. Author

N92-14439# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: EARTH SCIENCES
19 Nov. 1991 24 p Transl. into ENGLISH of various Russian articles
(JPRS-UES-91-006) Avail: CASI HC A03/MF A01

Abstracts of Soviet publications in various areas of Earth science are presented. The areas covered include: oceanography and atmospheric physics. K.S.

N92-23707# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: EARTH SCIENCES
19 Aug. 1991 29 p Transl. into ENGLISH from various Russian articles
(JPRS-UES-91-005) Avail: CASI HC A03/MF A01

A bibliography of USSR research in earth sciences is given. Topics covered include geology, oceanography, atmospheric physics, and ecology. Author

N92-32132# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: EARTH SCIENCES
23 Jul. 1992 40 p Transl. into ENGLISH from various Russian articles
(JPRS-UES-92-004) Avail: CASI HC A03/MF A01

A bibliography of Central Eurasian research in Earth sciences is given. Topics covered include oceanography, atmospheric physics, and ecology. Author

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EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

A92-16731
ANALYSIS OF THE LATEST GEODYNAMICS USING A CARTOGRAPHIC-AEROSPACE METHOD [ANALIZ NOVEISHEI GEODINAMIKI KARTOGRAFO-AEROKOSMICHESKIM METODOM]
V. M. GUBIN (Belorusskii Nauchno-Issledovatel'skii Geologorazvedochnyi Institut, Minsk, Belorussian SSR) and V. I. MIKHAILOV (Belorusskii Politekhnicheskii Institut, Minsk, Belorussian SSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), July-Aug. 1991, p. 52-58. In Russian. Aug. 1991 7 p In RUSSIAN refs
Copyright
A novel method for studying the latest geodynamics by integrating maps and aerospace photographs is described and is demonstrated by an analysis of a plain-platform territory. It is shown that the cartographic features correlate with the results of image interpretation. A geodynamical map of the Starobinskii block is compiled, and its neotectonic structures and tectonic-dynamical processes are analyzed. I.S.

A92-25327
APPLICATION OF SPECTRAL CORRELATION METHODS AND CATASTROPHE THEORY TO THE STUDY OF THE SPATIAL INHOMOGENEITY OF THE EARTH'S SURFACE [PRIMENENIE SPEKTRAL'NO-KORRELIATSIONNYKH METODOV I TEORII KATASTROF V IZUCHENII PROSTRANSTVENNOI NEODNORODNOSTI ZEMNOI POVERKHNOSTI]
B. M. BALTER, V. V. EGOROV, A. A. KUZ'MIN, and T. I. CHEKALINA (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Sept.-Oct. 1991, p. 10-15. In Russian. Oct. 1991 8 p In RUSSIAN
Copyright
Correlation structures of the spectra of an optical signal are used to investigate the internal boundaries of natural geosystems. The application of catastrophe theory reveals structure changes within them corresponding to conditions that are unstable and transient in space or time. Analysis of the correlation portraits makes it possible to detect a number of types of stable and transient conditions confirmed by the interpretation of synchronously obtained spaceborne images and by a priori information. P.D.

A92-25330
AUTOMATED THEMATIC PROCESSING OF AIRCRAFT SCANNER DATA GATHERED OVER PASTURE TERRITORY IN TURKMENIA [AVTOMATIZIROVANNAIA TEMATICHESKAIA OBRABOTKA DANNYKH SAMOLETNOGO SKANERA PO TERRITORII PASTBISHCH TURKMENII]
A. A. FEOKTISTOV, V. S. ARTEMKOV, V. A. ZELENIN, V. A. BOCHAROV, and E. IA. VOLCHENKO (Vsesoiuznyi Nauchno-Issledovatel'skii Tsentr AIUS-Agroresursy, Moscow, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Sept.-Oct. 1991, p. 25-30. In Russian. Oct. 1991 6 p In RUSSIAN refs
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A92-25332
A METHOD FOR THE OPTIMIZATION OF PARAMETERS OF SINGLE-ROUTE SATELLITE SYSTEMS FOR PERIODIC OBSERVATION OF THE EARTH [METOD OPTIMIZATSII PARAMETROV ODNOMARSHRUTNYKH SISTEM ISZ DLIA PERIODICHESKOGO OBZORA ZEMLI]
IU. N. RAZUMNYI Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Sept.-Oct. 1991, p. 39-46. In Russian. Oct. 1991 8 p In RUSSIAN refs
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A method is proposed for developing satellite systems for regular observation of a prescribed area of the earth surface which are optimal in terms of the criteria of the minimum duration of the maximum interval between observations, and the minimum bandwidth or minimum number of satellites in the system. The problem of choosing an optimal orbit altitude is highlighted. P.D.

A92-33797
DATA PROCESSING ISSUES IN AEROSPACE SYSTEMS FOR THE STUDY OF NATURAL RESOURCES [VOPROSY OBRABOTKI INFORMATSII V AEROKOSMICHESKIKH SISTEMAKH ISSLEDOVANIIA PRIRODNYKH RESURSOV]
M. A. RAKOV and IU. K. KHODAREV Otbor i Obrabotka Informatsii (ISSN 0474-8662), no. 7, 1991, p. 81-87. In Russian. 1991 7 p In RUSSIAN
Copyright
The principal problems arising in the design of data processing systems for the remote studies of natural resources are examined. In particular, attention is given to the estimation of the amount of data processed in such systems and the capacity of the data processing means. Typical operations used in the high-speed processing of large data bases are described, and the suitability of various specialized processors is evaluated. The general architecture and characteristics of separate components of remote sensing data processing systems are discussed. V.L.

A92-35214
SAR FACILITIES FOR 'PRIRODA' MISSION
N. A. ARMAND, A. A. KALINKEVICH, B. G. KUTUZA, and S. M. POPOV (Russian Academy of Sciences, Institute of Radioengineering and Electronics, Moscow, Russia) IN: IGARSS '91; Proceedings of the 11th Annual International Geoscience and Remote Sensing Symposium, Espoo, Finland, June 3-6, 1991. Vol. 3 1991 3 p
Copyright
The characteristics of the synthetic aperture radar (SAR) for the Priroda remote sensing mission are described. The objective is to study the backscatter data of different land-use types and ocean, and to attempt to develop methods in which the spatial variability attributable to intrinsic scene texture is tested in classification. Problems of SAR calibration are examined in detail. I.E.

A92-36403
COMBINED USE OF SPECTRAL BRIGHTNESS AND POLARIZATION CHARACTERISTICS OF UPWARD RADIATION IN REMOTE SENSING OF INLAND WATER BODIES [KOMPLEKSNOE ISPOL'ZOVANIE SPEKTRAL'NYKH IARKOSTNYKH I POLIARIZATSIONNYKH KHARAKTERISTIK VOSKHODIASHCHEGO IZLUCHENIIA V DISTANTSIONNOM ZONDIROVANII VNUTRENNIKH VODOEMOV]
A. A. BUZNIKOV, G. A. LAKHTANOV, K. A. MOKIEVSKII, V. B. RUMIANTSEV, and S. G. SHVAREVA (Sankt-Peterburgskii Elektrotekhnicheskii Institut; Rossiiskaia Akademiia Nauk, Institut Ozerovedeniia, St. Petersburg, Russia) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), no. 2, Mar.-Apr. 1992, p. 24-29. In Russian. Apr. 1992 6 p In RUSSIAN refs
Copyright
Measurements of upward radiation made onboard a ship in Lake Onega with a hand-held RSS-3 spectrograph are presented. It is shown that the effective wavelength based on spectral brightness measurements can be used for remote sensing of inland water bodies with different optical characteristics provided the latter are combined with measurements of the degree of polarization. Multiple regression equations were computed to link the relative water transparency with the effective wavelength and the degree of polarization of upward radiation. P.D.

A92-36406
EXTRAPOLATION OF DRILLING DATA BY NONLINEAR FILTERING OF AEROSPACE IMAGES OF THE EARTH SURFACE [EKSTRAPOLIATSIIA DANNYKH BURENIIA S POMOSHCH'IU NELINEINOI FIL'TRATSII AEROKOSMICHESKIKH IZOBRAZHENII ZEMNOI POVERKHNOSTI]
I. V. KALININ (Tsentral'naia Poiskovo-S'emochnaia Ekspeditsiia PGO Iakutskgeologiia, Yakutsk, Russia) and I. V. TERENT'EV (NII Kosmoaerogeologicheskikh Metodov, St. Petersburg, Russia) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), no. 2, Mar.-Apr. 1992, p. 41-47. In Russian. Apr. 1992 7 p In RUSSIAN refs
Copyright

Nonlinear filtering of remote sensing data is shown to enhance the accuracy of the extrapolation of drilling data. Using as an example two images of the same oil and gas region in western Iakutia that were synthesized by different methods using a lineament scheme, it was found that the correlation coefficient increases to 0.9 in the case of a very simple mask of 5 points for a nonlinear transformation of the third order. Partial image filtering increased the coefficient of the correlation between ground data and the transformed image to 0.7-0.8 in the specified domain. P.D.

A92-36410
METHODS FOR CLASSIFYING OPTICAL STATES OF WATER ECOSYSTEMS [METODY KLASSIFIKATSII OPTICHESKIKH SOSTOIANII VODNYKH EKOSISTEM]
I. IU. KAMOV and I. V. LOIKOVA (Gidrokhimicheskii Institut, Rostov-on-Don, Russia) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), no. 2, Mar.-Apr. 1992, p. 68-74. In Russian. Apr. 1992 7 p In RUSSIAN refs
Copyright

Sample covariation matrices (SCM) of spectral measurements as classification objects, and SCM eigenvectors and eigenvalues are proposed as classification features. Since the position of the plane of the main components in n-dimensional space is determined largely by the composition of water, the similarities or differences may be measured by the distance between planes of the main components of SCM or of two measurement samples. Estimates of statistically indistinguishable (equivalent) optical states are obtained for a standard probabilistic model with an arbitrary number of variables. The possibility of obtaining a more sophisticated classification method that takes into account the qualitative differences in the content of optically active substances in objects of remote sensing is shown. P.D.

A92-37634* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
THE GREAT CHINESE FIRE OF 1987 - A VIEW FROM SPACE
DONALD R. CAHOON, JR., JOEL S. LEVINE, WESLEY R. COFER, III, JAMES E. MILLER, PATRICK MINNIS, GEOFFREY M. TENNILLE, TOMMY W. YIP (NASA, Langley Research Center, Hampton, VA), BRIAN J. STOCKS (Forestry Canada, Sault-Ste.-Marie), and PATRICK W. HECK (Lockheed Engineering and Services Co., Hampton, VA) IN: Global biomass burning - Atmospheric, climatic, and biospheric implications 1991 6 p
Copyright

One of the largest forest fires ever recorded burned in the People's Republic of China (PRC) and the Soviet Union in May 1987. The fire covered over 1.0 million hectares in the PRC and almost 4 million hectares in the Soviet Union. The progress and areal extent of the fire were measured using satellite images analyzed in the imaging facilities at NASA-Langley and Forestry Canada. The analyses show the utility and value of satellite measurements to assess the areal extent and geographical distribution of fires, and have important implications for future measurements to be obtained from space platforms, such as the Earth Observing System. Author

A92-40645
AERIAL/SPACE VIDEO-REPORTING SURVEY [TELEREPORTAZHNAIA AEROKOSMICHESKAIA S'EMKA]
B. N. RODIONOV Geodeziia i Kartografiia (ISSN 0016-7126), no. 2, Feb. 1992, p. 21-25. In Russian. Feb. 1992 5 p In RUSSIAN
Copyright

The principal features, applications, and advantages of aerial/space video reporting as a new method for the remote sensing of agricultural resources are examined. The method consists in the use of portable video recording equipment to film agricultural resources from aircraft or spacecraft, with simultaneous recording of the operator's comments on the video tape. The film can then be viewed on any commercial TV set. The method combines the accuracy of instrumental observations with the immediate availability of a video report and is accessible to a wide range of users. A discussion of the geometrical and brightness characteristics of video images is included. V.L.

A92-41925
KEEPING AN EYE ON EARTH - REMOTE SENSING IN RUSSIA
ARNOL'D S. SELIVANOV (Institute of Space Device Engineering, Moscow, Russia) Planetary Report (ISSN 0736-3680), vol. 12, no. 3, May-June 1992, p. 11-15. Jun. 1992 5 p
Copyright

The Soviet space-based terrestrial remote-sensing program is briefly reviewed, from its beginnings in the late 1960s until the present. Consideration is given to the Resource-F photographic satellites, the Resource-O multispectral satellites (combining a survey camera with high-resolution pointable cameras), the Ocean-O satellites (especially designed for polar ice imaging), and ecological surveillance programs. Sample images are provided. T.K.

A92-53944
SYSTEM FOR CONTROLLING THE RECEPTION AND PROCESSING CENTER OF PRIORITY SATELLITE INFORMATION [SISTEMA UPRAVLENIIA TSENTROM PRIEMA I OBRABOTKI SPUTNIKOVOI INFORMATSII PERVOI OCHEREDI]
V. I. KHIZHNICHENKO and A. V. KUKHARSKII IN: Methods and tools for the processing of remote sensing data on the parameters of the environment 1991 9 p In RUSSIAN refs
Copyright

The paper examines the hardware and software structure of a system for controlling the reception and processing center of satellite remote-sensing information. Descriptions are given of the main software modules realizing support of the special-purpose data base, remote intermachine information exchange, prediction of the center-of-mass motion of the satellite, and spacecraft-survey planning taking user requirements into account. L.M.

N92-11451# Academy of Sciences (USSR), Gorky. Inst. of Applied Physics.
NONLINEAR THEORY OF SYNTHETIC APERTURE RADAR SEA WAVE IMAGING
M. B. KANEVSKY *In* ESA, Physical Measurements and Signatures in Remote Sensing, Volume 1 p 285-287 May 1991
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

The Synthetic Aperture Radar (SAR) sea wave imaging mechanism is shown to be nonlinear for any sea wave directions except for the nearly radial one. The SAR image spectrum for azimuthally traveling waves is found with the speckle noise taken into account. ESA

N92-11478# Academy of Sciences (USSR), Moscow. Inst. of Applied Mathematics.
MULTIANGULAR APPROACH TO SOLUTION OF ATMOSPHERE OPTICS REVERSE PROBLEMS
A. A. IOLTUKHOVSKI *In* ESA, Physical Measurements and Signatures in Remote Sensing, Volume 1 p 423-425 May 1991

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

An approach to identifying the atmosphere and surface optical characteristics based upon accurate formalism of the transport theory is addressed. Measurement of radiation intensity in different directions enables to solve the following problems: identification of full optical thickness using measurement of intensity abrupt changes (instrumentation resolution impact upon identification error is discussed); identification of the mean characteristics of atmosphere and mean albedo on the basis of a priori information concerning relationship between these characteristics and optical parameters of atmosphere, as well as using parametrization of transmission function; identification of inhomogeneous albedo for optical thin atmosphere. This method enables to obtain a spectrum of optical characteristics of the atmosphere and albedo. ESA

N92-70094 Meteorological Office, Bracknell (England).
A MODEL OF THE REGULATION OF RUN-OFF USING SHORT-RANGE FORECASTS
YE. G. POPOV and P. YU. KHARCHENKO 1991 7 p Transl. into ENGLISH from Gidromet. Nauchno-Issled. Tsentr. SSSR, Leningrad (USSR), v. 295, 1988 p 89-97
(BLL-MO-TRANS-1707(5733.360); TN-974) Avail: CASI HC A02

The role of a comprehensive control of water resources has grown in the last decade and hydrological forecasting is becoming an essential part of this control. Economic efficiency is a decisive factor in any project concerning protection from flooding. A comprehensive relation between forecaster and consumer is presupposed, as is the correction to forecasts, depending on their errors and on the fluctuating use of water resources, in the context of new information. Regulation of run-off by the use of reservoirs and automated control systems is a principal measure of protection from flooding. Regulation of run-off as a flood protection measure comes in two types: (1) total regulation, when a reservoir is built directly above a protected section of river with a regard to excluding totally the possibility of flooding in the protected zone; and (2) partial, when regulation of run-off is effective over only a part of the catchment area. Author

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ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower.

A92-21675
NUCLEAR POWER ENGINEERING IN SPACE - A NEW TREND IN THE POWER INDUSTRY OF THE FUTURE [KOSMICHESKOE ATOMNOE ENERGOMASHINOSTROENIE - NOVOE NAPRAVLENIE V ENERGETIKE BUDUSHCHEGO]
G. M. GRIAZNOV Akademiia Nauk SSSR, Izvestiia, Energetika i Transport (ISSN 0002-3310), Nov.-Dec. 1991, p. 24-33. In Russian. Dec. 1991 10 p In RUSSIAN
Copyright

Current developments and trends in space nuclear power engineering are reviewed. In particular, attention is given to the development of a space nuclear power plant, Topaz, with a thermionic converter of thermal nuclear energy to electric power. Some engineering challenges and problems that have to be solved when designing, constructing, and operating first space-based nuclear power plants are identified, and prospects for the future are discussed. V.L.

A92-40404
SPS INTEREST AND STUDIES IN USSR
VLADIMIR PRISNIAKOV (Dnepropetrovskii Gosudarstvennyi Universitet, Dnepropetrovsk, Ukraine) IN: SPS 91 - Power from space; Proceedings of the 2nd International Symposium, Gif-sur-Yvette, France, Aug. 27-30, 1991 1991 9 p refs

Recent Soviet investigations of solar energy conversion systems for use on Solar Power Satellites (SPS) are discussed. Studies of solar energy plants with phototransformers and with machine transformation are addressed. A step-by-step development of power supply from an SPS is outlined, and steps already taken with a view to such a power supply are reviewed. C.D.

A92-40432
MODELING OF THE DEVELOPMENT AND INFRASTRUCTURE OF SOLAR ELECTRIC POWER STATIONS
I. KURKIN, D. SEVRUK, D. SIDOROV, M. KUKOLEV, and V. GORCHAKOV (Moskovskii Aviatsionnyi Institut, Moscow, Russia) IN: SPS 91 - Power from space; Proceedings of the 2nd International Symposium, Gif-sur-Yvette, France, Aug. 27-30, 1991 1991 3 p

Mathematical models and computer programs for technical and economic studies of solar power stations are discussed. Methods for improving solar, nuclear, and combined power facility processes are analyzed. C.D.

A92-40433
THE COMPLEXATION METHOD OF ENERGY GENERATION AND ANGULAR MOTION CONTROL SYSTEMS FOR SPACE SOLAR ENERGY STATION CONCEPT
V. G. KONOV, V. S. MANUILOV, U. V. PRISHCHEPA, and S. V. SHENDEREV (St. Petersburg Air-Space Ecology Centre, Russia) IN: SPS 91 - Power from space; Proceedings of the 2nd International Symposium, Gif-sur-Yvette, France, Aug. 27-30, 1991 1991 7 p refs

A complexation method for the main subsystems of space solar energy station is proposed. To model this method, an analytic technique of resolving structural parametric synthesis tasks is given using a complex economic effectiveness criterion. The model enables investigation of the interactions of position and angular motion control systems, solar batteries, and the active phased array. C.D.

A92-55873
POSSIBLE APPLICATION ANALYSIS OF ELECTROMAGNETIC RADIATION BEAMS IN SPACE ENERGETICS
V. V. RYBAKOV and A. P. SMAKHTIN (Moscow Aviation Institute, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 6 p. Aug. 1992 6 p refs
(IAF PAPER 92-0582) Copyright

Various aspects of the possible application of focused electromagnetic radiation beams in the range from microwave to optical frequencies are discussed. It is not possible to analyze the various problems of this application and the different projects of practical realization of electromagnetic radiation beams in space energetics unless the priority system and the criterion system are elaborated. This report proposes one possible version of these systems which allows the possible electromagnetic radiation space energetics classification. R.E.P.

A92-55881
PROSPECTS OF DEVELOPMENT OF ENVIRONMENTALLY SAFE SYSTEM SUPPLYING POWER FROM SPACE
ANATOLII S. KOROTEEV, VITALII F. SEMENOV, IURII M. ES'KOV, and VLADIMIR N. AKIMOV (Scientific-Research Institute of Thermal Processes, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 8 p. Aug. 1992 8 p refs
(IAF PAPER 92-0594) Copyright

A concept for supplying power to earth from space using an orbital space solar power stations, microwave stations, and a lunar complex for He-3 extraction is described. The realization of the concept in three stages during 2000-2030 and beyond is addressed. C.D.

A92-55884
FULL-SCALE SPACE EXPERIMENTAL L-SPS - DIRECT ENERGY CONVERSION OF SOLAR RADIATION TO LASER RADIATION AND ITS TRANSMISSION TO GROUND-BASED POWER GRID
IU. I. KRUZHILIN (NPO Astrofizika, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. Aug. 1992 10 p refs
(IAF PAPER 92-0597) Copyright

The possibility of producing electric energy using laser-solar power satellites (L-SPS) in the near future is examined. A full-scale experimental L-SPS is proposed as a module of a global space energy network. It is suggested that an electric power of approximately 10 MW is attainable at the surface as a result of laser-radiation energy conversion. Specialized large-scale experiments are described which provide diffraction-limited laser beams with a divergence of 1.7 x 10 exp -6 radian. L.M.

45

ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

A92-29726
CARCINOGENIC HYDROCARBONS EMISSION WITH GAS-TURBINE ENGINES EXHAUST GASES
IU. KNYSH IN: CUSAE '91; Proceedings of the 1st China-USSR Seminar on Aero Engines, Nanjing, People's Republic of China, Apr. 15-20, 1991 1991 8 p refs

Results are presented from an experimental study of carcinogenic benzapyrene emissions in gas turbine exhaust gases. Despite the wide range of characterisics among the engines tested, emission maximum levels are uniformly observed in the low power regime, while minimum levels typify full-power operation. An investigation of fuel diffusive combustion processes showed that the greatest concentration of benzapyrene occurs in the initial section of the flame, where fuel pyrolysis occurs under conditions of oxygen deficit. O.C.

A92-49201
MATHEMATICAL MODELING OF LARGE-SCALE METEOROLOGICAL EFFECTS CAUSED BY POLLUTION OF THE ATMOSPHERE BY STRONGLY ABSORBING AEROSOL [MATEMATICHESKOE MODELIROVANIE KRUPNOMASSHTABNYKH METEOROLOGICHESKIKH EFFEKTOV, OBUSLOVLENNYKH ZAGRIAZNENIEM ATMOSFERY SIL'NOPOGLOSHCHAIUSHCHIM AEROZOLEM]
S. A. SOLDATENKO (Voennyi Inzhenerno-Kosmicheskii Institut, Russia) Rossiiskaia Akademiia Nauk, Izvestiia, Fizika Atmosfery i Okeana (ISSN 0002-3515), vol. 28, no. 2, Feb. 1992, p. 115-128. In Russian. Feb. 1992 14 p In RUSSIAN refs
Copyright

Large-scale meteorological effects caused by massive emission of smoke into the atmosphere are investigated using a three-dimensional hemispheric telescopic model based on fully hydrodynamic equations, in which cloud transfer processes are described using Lagrangian and Eulerian methods. Model-based examples of numerical experiments are presented. Optical characteristics, the vertical and horizontal distributions of smoke clouds at different times, and the effect of smoke clouds on the thermodynamic parameters of the atmosphere were determined. I.S.

N92-22310# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: EARTH SCIENCES. ECOLOGICAL CONSEQUENCES ON CHERNOBYL
23 Jan. 1992 48 p Transl. into ENGLISH of various Russian articles
(JPRS-UES-92-001) Avail: CASI HC A03/MF A01

A bibliography is given of Central Eurasian earth sciences, specifically the environmental consequences of the nuclear power reactor accident at Chernobyl. Topics covered include the physicomathematical simulation of the behavior of radionuclides, the radioactive pollution of the Dnepr Basin, plutonium in soils, the Chernobyl Forest, and the combined mapping of polluted territories. Author

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GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

A92-10829
CHECKING THE STABILITY OF THE OPTICAL PROPERTIES OF THE ATMOSPHERE [O KONTROLE USTOICHIVOSTI OPTICHESKIKH SVOISTV ATMOSFERY]
T. Z. MULDASHEV, V. E. PAVLOV, and IA. A. TEIFEL' (AN KSSR, Institut Matematiki i Mekhaniki and Astrofizicheskii Institut, Alma-Ata, Kazakh SSR) Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana (ISSN 0002-3515), vol. 27, Aug. 1991, p. 831-841. In Russian. Aug. 1991 11 p In RUSSIAN refs
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The absolute brightness indicatrices for the clear atmosphere in the visible region of the spectrum are computed using the spherical harmonics technique. The effects of aerosol fractions of the Aitken cores and submicron and hard-dispersed particles on the sky brightness are studied. Some limitations of the technique used for checking the stablity of the earth atmosphere's optical properties are identified. Approximation relations are derived for determining the aerosol optical column at any specific moment from observations of brightness indicatrices. P.D.

A92-11690
THE OZONE AND AEROSOL FINE STRUCTURE EXPERIMENT: OBSERVING THE FINE STRUCTURE OF OZONE AND AEROSOL DISTRIBUTION IN THE ATMOSPHERE FROM THE SALYUT 7 ORBITER. I - INTRODUCTION AND THE OCCULTATION EXPERIMENT
G. M. GRECHKO, N. F. ELANSKII, M. E. PLOTKIN, and O. V. POSTYLIAKOV (AN SSSR, Institut Fiziki Atmosfery, Moscow, USSR) Journal of Geophysical Research (ISSN 0148-0227), vol. 96, Oct. 20, 1991, p. 18,647-18,653. 20 Oct. 1991 7 p refs
Copyright

The Ozone and Aerosol Fine Structure experiment, conducted on the Soviet Salyut 7 orbiting station in September 1985, was intended to study ozone and aerosol fine structure in the atmosphere. The experimental technique was to combine the observations of the distribution of species from the attenuation of radiation on tangent routes with photographic observations of the earth's twilight limb. The photographic method used for measuring the vertical distribution of attenuating atmospheric components from spacecraft does not call for sophisticated instrumentation. An absorption method was used for the experiment, and a complete mathematical model of this method was constructed. The model associated directly measured values with atmospheric characteristics of interest. An algorithm of the measured data processing was used to obtain minimal errors of the ozone and aerosol retrieval on the basis of the complete model of the experiment, which contains measuring errors. This method makes it possible to reconstruct ozone profiles and aerosol extinction profiles in the stratosphere with low errors (5 to 10 percent), and high spatial resolution (about 1 km). Author

A92-11691
THE OZONE AND AEROSOL FINE STRUCTURE EXPERIMENT: OBSERVING THE FINE STRUCTURE OF OZONE AND AEROSOL DISTRIBUTION IN THE ATMOSPHERE FROM THE SALYUT 7 ORBITER. II - FORMATION OF THE EARTH'S TWILIGHT LIMB COLORATION AND RADIANCE: NUMERICAL CALCULATIONS
N. F. ELANSKII, M. E. PLOTKIN, O. V. POSTYLIAKOV (AN SSSR, Institut Fiziki Atmosfery, Moscow, USSR), and S. A. UKHINOV (AN SSSR, Vychislitel'nyi Tsentr, Novosibirsk, USSR) Journal of Geophysical Research (ISSN 0148-0227), vol. 96, Oct. 20, 1991, p. 18,655-18,660. 20 Oct. 1991 6 p refs
Copyright
Monte Carlo calculations of the earth's twilight limb spectral radiance and coloration in a model of the spherical atmosphere are carried out for layered vertical distributions of ozone and aerosol. The possibility of space monitoring of ozone and aerosol stratification based on the panoramic twilight limb observations is studied. It is shown that for background aerosol conditions, stratospheric ozone layers 2-3 km in thickness manifest themselves in the twilight limb in the form of blue bands with increased color saturation. In the case of greatly enhanced aerosol content (compared with background conditions) the layered twilight coloration in the tropospheric and low stratospheric region is caused by aerosol layers. Author

A92-11692
THE OZONE AND AEROSOL FINE STRUCTURE EXPERIMENT: OBSERVING THE FINE STRUCTURE OF OZONE AND AEROSOL DISTRIBUTION IN THE ATMOSPHERE FROM THE SALYUT 7 ORBITER. III - EXPERIMENTAL RESULTS
N. F. ELANSKII, G. M. GRECHKO, M. E. PLOTKIN, and O. V. POSTYLIAKOV (AN SSSR, Institut Fiziki Atmosfery, Moscow, USSR) Journal of Geophysical Research (ISSN 0148-0227), vol. 96, Oct. 20, 1991, p. 18,661-18,670. 20 Oct. 1991 10 p refs
Copyright
An investigation of the fine structure of the ozone and aerosol distribution in the atmosphere through photography of the rising and setting sun in four wavelengths and of the earth's twilight limb was performed from the Soviet orbital station Salyut 7 in September 1985. Using a renewed mathematical algorithm, vertical distributions of ozone and aerosol and their layered structure over separate regions were derived from photographs. Subsequent validation of the data obtained has confirmed that the data were retrieved with sufficient accuracy. Analysis of the images obtained reveals typical features of the fine structure of aerosol distribution in the troposphere and stratosphere. The aerosol layered structure was observed in the northern and southern hemispheres at the heights 0-18 km and 0-36 km, respectively. In both hemispheres the aerosol fine structure possesses equal altitudinal periodicity of 2.4-2.6 km. Author

A92-16729
A SPECTRAL-ANGULAR METHOD FOR DETERMINING OPTICAL CHARACTERISTICS OF THE ATMOSPHERE AND THE SURFACE, USING DATA FROM THE MKS-M INSTRUMENT ABOARD SALYUT-7 STATION [SPEKTRAL'NO-UGLOVOI METOD OPREDELENIIA OPTICHESKIKH KHARAKTERISTIK ATMOSFERY I POVERKHNOSTI, REALIZOVANNYI NA STANTSII 'SALIUT-7' PO DANNYM APPARATURY MKS-M]
V. V. BADAEV, A. I. LIAPUSTIN, I. M. MANSUROV, and T. Z. MULDASHEV (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR; AN KSSR, Institut Matematiki i Mekhaniki, Alma-Ata, Kazakh SSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), July-Aug. 1991, p. 27-35. In Russian. Aug. 1991 9 p In RUSSIAN refs
Copyright
It is shown that concentrations of anthropogenic aerosol above regions of industrial smog production can be obtained using data from angular and nadir measurements of brightness in the 450-780 nm range and at 760 nm. Measurements were made with the MKS-M spectrometer aboard Salyut-7. The complex spectral-angular method used to determine the parameters of the atmosphere and the earth surface is described in detail. Results are presented of the analysis of smog haze above Zaporozh'e. I.S.

A92-16757
DISPERSION AND MATCHING PROPERTIES OF INHOMOGENEOUS PLASMA WAVEGUIDES [O DISPERSIONNYKH I SOGLASUIUSHCHIKH SVOISTVAKH NEODNORODNYKH PLAZMENNYKH VOLNOVODOV]
A. V. KUDRIN and G. A. MARKOV (Nizhegorodskii Gosudarstvennyi Universitet, Nizhni Novgorod, USSR) Radiofizika (ISSN 0021-3462), vol. 34, Feb. 1991, p. 163-172. In Russian. Feb. 1991 10 p In RUSSIAN refs
Copyright
The dispersion characteristics and field structure of axially symmetrical types of waves guided by a plasma inhomogeneity with a high concentration extended along the external magnetic field are determined in the whistler-frequency range. The possibility of small-antenna matching with background plasma by means of the plasma inhomogeneity is shown theoretically and experimentally. P.D.

A92-19639
MAGNETIC FLUX ROPE TYPE STRUCTURES IN THE GEOMAGNETIC TAIL
A. E. ANTONOVA and A. P. KROPOTKIN (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) (Solar-terrestrial physics; International SCOSTEP Symposium, 7th, The Hague, Netherlands, June 25-30, 1990, Selected Papers. A92-19628 06-46) Journal of Atmospheric and Terrestrial Physics (ISSN 0021-9169), vol. 53, Nov.-Dec. 1991, p. 1073-1079. Dec. 1991 7 p refs
Copyright
Some structures in the geomagnetic tail observed by the Prognoz 9 and ISEE spacecraft as 'magnetic flux ropes' are identified, and new features are emphasized. The structures are associated with considerable fluxes of energetic ions and electrons. Particles are effectively energized at magnetic field discontinuities, resulting in the generation of spectra extending up to MeV energies. An external field source (i.e., the interplanetary magnetic field) may be of essential importance for the generation of the flux ropes whose axes lie in the cross-tail direction. Author

A92-21553
DISPERSION PROPERTIES OF A PLASMA IN THE VICINITY OF A SPACECRAFT DURING ELECTRON-BEAM INJECTION [DISPERSIONNYE SVOISTVA PLAZMY V OKRESTNOSTI KOSMICHESKOGO APPARATA PRI INZHEKTSII ELEKTRONNOGO PUCHKA]
A. IU. BOGOMOLOV and V. A. FEDOROV (AN SSSR, Radiotekhnicheskii Institut, Moscow, USSR) Geomagnetizm i Aeronomiia (ISSN 0016-7940), vol. 31, Nov.-Dec. 1991, p. 1011-1016. In Russian. Dec. 1991 6 p In RUSSIAN refs
Copyright
The paper presents a theoretical analysis of the dispersion properties of the ionospheric plasma in the vicinity of a spacecraft during electron-beam injection along the geomagnetic field. The dispersion equation is obtained, and the limiting cases of the solutions are examined as a function of the wave vector and the parameters of the electron beam and the ionospheric plasma. L.M.

A92-27516
MODEL ESTIMATES OF POSTVOLCANIC RELAXATION OF THE OPTICAL PROPERTIES OF THE STRATOSPHERIC LAYER [MODEL'NYE OTSENKI POSTVULKANICHESKOI RELAKSATSII OPTICHESKIKH SVOISTV STRATOSFERNOGO SLOIA]
R. F. RAKHIMOV (AN SSSR, Institut Optiki Atmosfery, Tomsk, USSR) Optika Atmosfery (ISSN 0235-277X), vol. 4, June 1991, p. 645-652. In Russian. Jun. 1991 8 p In RUSSIAN refs
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A model is developed for simulating the variability of the optical

characteristics of stratospheric aerosol during the postvolcanic relaxation of the layer. Model estimates are presented of the joint effects of the sedimentation, due to gravity, and spreading, due to macroturbulence, in the eruption-related cloud on the optical properties of the stratosphere. I.S.

A92-27545
A REDUCTION IN THE THRESHOLD CURRENT FOR THE IGNITION OF A BEAM-PLASMA DISCHARGE [O SNIZHENII POROGOVOGO TOKA ZAZHIGANIIA PPR]
I. N. MESHKOV and E. M. SYRESIN (AN SSSR, Institut Iadernoi Fiziki, Novosibirsk, USSR) Fizika Plazmy (ISSN 0367-2921), vol. 17, Nov. 1991, p. 1404-1407. In Russian. Nov. 1991 4 p In RUSSIAN refs
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The possibility of reducing the ignition threshold of a beam-plasma discharge by injecting the electron beam between two electrostatic barriers (double layers) is investigated. The electrostatic barriers retain the plasma, which lowers the threshold current and expands the pressure range in which the discharge is formed. An implementation of this method for the excitation of a beam-plasma discharge makes it possible to use electron injectors with a low beam current in active experiments in cosmos. The method can also be used to reduce the threshold current in plasma-chemical devices. V.L.

A92-30291
A METHOD FOR MEASURING THE ELECTRIC FIELD VECTOR IN METEOROLOGICAL-ROCKET EXPERIMENTS [METODIKA IZMERENIIA VEKTORA ELEKTRICHESKOGO POLIA V EKSPERIMENTAKH NA METEOROLOGICHESKIKH RAKETAKH]
V. S. TSYBUL'SKII Kosmicheskaia Nauka i Tekhnika (ISSN 0321-4508), no. 5, 1990, p. 51-56. In Russian. 1990 6 p In RUSSIAN refs
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The paper describes a method for measuring the strength of the ionospheric electric field by two sensors placed on board a meteorological rocket and investigates the errors inherent in the method. It is shown that the limit of the method sensitivity is in the range of tenths of a millivolt per meter. I.S.

A92-30321
MODIFICATION OF THE IONOSPHERE DURING MILITARY ACTIONS IN THE PERSIAN GULF REGION [MODIFIKATSIIA IONOSFERY VO VREMIA VOENNYKH DEISTVII V ZONE PERSIDSKOGO ZALIVA]
O. A. POKHOTELOV, V. A. LIPEROVSKII, IU. P. FOMICHEV, L. N. RUBTSOV, O. A. ALIMOV, Z. S. SHARADZE, and R. KH. LIPEROVSKAIA (AN SSSR, Institut Fiziki Zemli, Moscow, USSR; AN Tadzhikistana, Institut Astrofiziki, Dushanbe, Tajikistan; Tbilisskii Gosudarstvennyi Universitet, Tbilisi, Georgia) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 321, no. 6, 1991, p. 1168-1172. In Russian. 1991 5 p In RUSSIAN refs
Copyright
Increases in ionospheric plasma density were observed at distances of several thousand kilometers from the region subjected to bombing in the Gulf War. Also observed was a tendency for this increase to be limited after about two weeks. The physical mechanism for these ionospheric changes appears to be connected not only with the cumulative effect of acoustic-gravity waves on the ionosphere but also with the contamination of the atmosphere with dust (metal particles and sand) and the consequent scattering of solar radiation by these particles. L.M.

A92-32020
OBSERVATIONS OF NOCTILUCENT CLOUDS AND AEROSOL LAYERS IN THE STRATOSPHERE AND MESOSPHERE FROM THE SALYUT-7 AND MIR ORBITAL STATIONS [NABLIUDENIIA SEREBRISTYKH OBLAKOV I AEROZOL'NYKH SLOEV V STRATO-MEZOSFERE S ORBITAL'NYKH STANTSII 'SALIUT-7' I 'MIR']
A. I. LAZAREV, V. N. LEBEDINETS, L. A. MIRZOEVA, V. P. SAVINYKH, and V. G. TITOV (Gosudarstvennyi Opticheskii Institut, St. Petersburg; Institut Eksperimental'noi Meteorologii, Obninsk, Russia) Astronomicheskii Vestnik (ISSN 0320-930X), vol. 26, Jan.-Feb. 1992, p. 115-125. In Russian. Feb. 1992 11 p In RUSSIAN refs
Copyright
Information from the log of cosmonauts Savinykh and Titov on observations of noctilucent and mesospheric clouds from space in 1985 and 1988 is presented. The equatorial mesospheric clouds (EMCs) discovered earlier by Kovalenko and Ivanchenkov differ significantly from polar mesospheric clouds (PMCs). The genesis of PMCs and EMCs are considered in the light of the hypothesis of the cometary origin of water in the upper atmosphere. P.D.

A92-33578
TIME-DEPENDENT LOCALIZED RECONNECTION OF SKEWED MAGNETIC FIELDS
VLADIMIR S. SEMENOV, IGOR' V. KUBYSHKIN, VALENTINA V. LEVEDEVA, MARINA V. SIDNEVA (Sankt-Peterburgskii Gosudarstvennyi Universitet, St. Petersburg, Russia), HELFRIED K. BIERNAT, MARTIN F. HEYN, BRUNO P. BESSER (Oesterreichische Akademie der Wissenschaften, Institut fuer Weltraumforschung, Graz, Austria), and RICHARD P. RIJNBEEK (Saint Andrews, University, Scotland) Journal of Geophysical Research (ISSN 0148-0227), vol. 97, no. A4, April 1, 1992, p. 4251-4263. 1 Apr. 1992 13 p refs
(Contract FFWF PROJECT P-8046)
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A model for time-varying, localized reconnection in a current sheet with skewed magnetic field orientations at opposite sides is described and analyzed. The analysis is restricted to an incompressible plasma, in which case the Alfven wave and the slow shock merge to form shocks bounding the field reversal or outflow region, and to the case of weak reconnection, which implies that the reconnection electric field is much smaller than the product of the characteristic values of the external field strength and Alfven speed. This model can be applied to the earth's magnetopause, where reconnection is considered to be the dominant process coupling the solar wind and the magnetosphere. The results can be used to interpret different manifestations of reconnection such as accelerated plasma flows along the magnetopause and flux transfer events. P.D.

A92-36565
PLASMA DECELERATION IN AN ANTISOLAR-CONVECTION LAYER DUE TO NONZERO IONOSPHERIC CONDUCTIVITY [TORMOZHENIE PLAZMY V SLOE ANTISOLNECHNOI KONVEKTSII ZA SCHET OTLICHNOI OT NULIA PROVODIMOSTI IONOSFERY]
M. V. SAMOKHIN (Rossiiskaia Akademiia Nauk, Moskovskii Radiotekhnicheskii Institut, Moscow, Russia) Geomagnetizm i Aeronomiia (ISSN 0016-7940), vol. 32, no. 1, Jan.-Feb. 1992, p. 59-64. In Russian. Feb. 1992 6 p In RUSSIAN refs
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It is shown that the plasma in an antisolar-convection layer (ASCL) accelerated along the magnetopause by a gas-pressure gradient away from the subsolar point to the magnetospheric tail can be decelerated due to the appearance of a current which is directed opposite to the electric field of polarization in the ASCL and which is a polarization-field discharge current through the ionosphere with a nonzero Pedersen conductivity. The plasma-deceleration effect in the ASCL is not that significant for quiet geomagnetic conditions but can increase significantly with increasing conductivity due to particle precipitation. L.M.

A92-36572
PHASE-DIFFERENCE RADIOTOMOGRAPHY OF THE IONOSPHERE [FAZORAZNOSTNAIA RADIOTOMOGRAFIIA IONOSFERY]
E. S. ANDREEVA, V. E. KUNITSYN, and E. D. TERESHCHENKO (Moskovskii Gosudarstvennyi Universitet, Moscow, Russia) Geomagnetizm i Aeronomiia (ISSN 0016-7940), vol. 32, no. 1,

Jan.-Feb. 1992, p. 104-110. In Russian. Feb. 1992 7 p In RUSSIAN refs
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A method is developed for the radiotomography of large plasma irregularities in the ionosphere on the scale of hundreds of kilometers. The proposed phase-difference tomography method is based on measurements of the Doppler frequency of a radio wave from a moving satellite. Numerical simulation and experimental results are presented on the radiotomography of global structures with a sounding source on the satellite and three receivers on the Murmansk-Moscow line, situated in the flight plane of a navigation satellite. L.M.

A92-36589
AMPLITUDE VARIATIONS OF PROBING SIGNALS AND OBLIQUE-SOUNDING IONOGRAMS IN CONNECTION WITH THE EFFECT OF HIGH-POWER OBLIQUE RADIO TRANSMISSIONS ON THE IONOSPHERE [IZMENENIIA AMPLITUDY PROBNYKH SIGNALOV I IONOGRAMM NZ PRI VOZDEISTVII NA IONOSFERU MOSHCHNOGO NAKLONNOGO RADIOIZLUCHENIIA]
N. F. BLAGOVESHCHENSKAIA, G. S. BOCHKAREV, N. N. BULATOVA, A. U. ZHIL'TSOV, T. A. MITROFANOVA, K. A. TROSHKINA, IU. N. CHERKASHIN, IU. A. CHERNOV, and I. A. SHUMILOV (IZMIRAN, Troitsk; Arkticheskii i Antarkticheskii NII; NII Radio, St. Petersburg, Russia) Geomagnetizm i Aeronomiia (ISSN 0016-7940), vol. 32, no. 1, Jan.-Feb. 1992, p. 175-178. In Russian. Feb. 1992 4 p In RUSSIAN refs
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A92-39496
STUDY OF ELECTROMAGNETIC EMISSIVE POWER OF MOVING IONOSPHERIC PLASMA ON THE BASIS OF UNIVERSAL NUMERICAL MODEL CONSTRUCTED ON EXACT EXPRESSIONS
V. L. SAVEL'EV and E. V. ZHELEZNIAKOV (Kazakhstan Academy of Sciences, Institute of Ionosphere, Alma-Ata) Planetary and Space Science (ISSN 0032-0633), vol. 40, no. 4, April 1992, p. 509-517. Apr. 1992 9 p refs
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The exact Green's function for the problem of generation of electromagnetic disturbances by vertically inhomogeneous acoustic-gravity waves has been constructed for a homogeneous non-isotropic plasma. Explicit analytical expressions for the calculation of the electromagnetic field have been obtained for an inhomogeneous plane-stratified ionosphere. The results of the numerical evaluation of the Green's function, characterizing the emissive power of real moving ionospheric plasma are given. The influence of the AGW wave vector direction on the effectiveness of the two types of wave disturbance excitation in an ionospheric plasma has been studied. Author

A92-39498
STRONG LANGMUIR TURBULENCE AND BEAM-PLASMA DISCHARGE IN THE IONOSPHERIC PLASMA
IU. A. OMEL'CHENKO, V. I. SOTNIKOV, V. D. SHAPIRO, and V. I. SHEVCHENKO (Russian Academy of Sciences, Space Research Institute, Moscow, Russia) Planetary and Space Science (ISSN 0032-0633), vol. 40, no. 4, April 1992, p. 535-540. Apr. 1992 6 p refs
Copyright

A numerical model of beam-plasma discharge is presented which is based on the 1D theory of strong Langmuir turbulence generated by an electron beam injected into the plasma. Simulation results indicate that during a beam injection period the plasma density may exceed several times its initial value due to multiact ionization of the neutral gas by heated electrons. O.G.

A92-40794
ENERGY SPECTRA OF HIGH-ENERGY ELECTRONS AND POSITRONS UNDER THE EARTH'S RADIATION BELT [ENERGETICHESKIE SPEKTRY ELEKTRONOV I POZITRONOV VYSOKIKH ENERGII POD RADIATSIONNYM POIASOM ZEMLI]
S. A. VORONOV, A. M. GAL'PER, S. V. KOLDASHOV, L. V. MASLENNIKOV, V. V. MIKHAILOV, and A. V. POPOV (Moskovskii Inzhenerno-Fizicheskii Institut, Moscow, Russia) (Vsesoiuznaia Konferentsiia po Kosmicheskim Lucham, Dagomys, Russia, Nov. 1-3, 1990, Materialy. A92-40776 16-93) Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaia (ISSN 0367-6765), vol. 55, no. 10, Oct. 1991, p. 1938-1941. In Russian. Oct. 1991 4 p In RUSSIAN refs
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Experimental measurements of electrons and positrons with energies of 10-200 MeV at an altitude of 350 km outside the earth's radiation belt in the L range 0.95-5.0 are presented. Results of a comparison between the data obtained and calculations are discussed. P.D.

A92-44066
RADIATION INTENSITY IN METEOR SPECTRA [OB INTENSIVNOSTI IZLUCHENIIA V METEORNYKH SPEKTRAKH]
V. A. SMIRNOV (Odesskii Elektrotekhnicheskii Institut Sviazi, Odessa, Ukraine) Astronomicheskii Vestnik (ISSN 0320-930X), vol. 26, no. 2, Mar.-Apr. 1992, p. 116-120. In Russian. Apr. 1992 5 p In RUSSIAN refs
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Various mechanisms responsible for spectral-line radiation in meteor spectra are considered. Theoretical intensities of the meteor spectral lines are compared with experimental intensity values. The effect of different external physical conditions on the radiation in the meteor spectrum formation process is evaluated. The solution of the kinetic equation as applied to the problem of the dispersion of a meteor plasma cluster is considered. P.D.

A92-44071
TAKING INTO ACCOUNT THE LAPLACE CONDITION WHEN DEVELOPING FINITE-ELEMENT MODELS OF THE EARTH'S GRAVITATION FIELD [OB UCHETE USLOVIIA LAPLASA PRI POSTROENII KONECHNO-ELEMENTNYKH MODELEI GRAVITATSIONNOGO POLIA ZEMLI]
V. B. NEPOKLONOV Geodeziia i Aerofotos'emka (ISSN 0536-101X), no. 5, 1991, p. 74-77. In Russian. 1991 4 p In RUSSIAN refs
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A92-44296
OZAFS SPACE EXPERIMENT FOR OBSERVING THE FINE STRUCTURE OF THE OZONE AND AEROSOL DISTRIBUTION IN THE ATMOSPHERE
G. M. GRECHKO, N. F. ELANSKII, M. E. PLOTKIN (Russian Academy of Sciences, Institute of Atmospheric Physics, Moscow, Russia), O. V. POSTYLIAKOV (Central Aerological Observatory, Dolgoprudny, Russia), and S. A. UKHINOV (Russian Academy of Sciences, Computing Centre, Novosibirsk, Russia) (The earth's middle and upper atmosphere; Proceedings of the Topical Meeting of the Interdisciplinary Scientific Commission C /Meetings C6, C7, C9, C10 and C11/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-44276 18-46) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 10, Oct. 1992, p. 157-160. Oct. 1992 4 p refs
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An experiment designed to investigate the fine structure of the ozone and aerosol distribution in the atmosphere was performed from the Soviet orbital station Salyut 7 in September 1985. The experiment involved photographing the rising or setting sun in four wavelengths and photographing the earth's twilight aureole. Using of a previously determined mathematical algorithm, vertical distributions of ozone and aerosol and their layered structure over separate regions were retrieved from photograph analysis. The validation of the data obtained confirms the adequate accuracy of the retrieval. The analysis of the images obtained revealed the structure of the typical features of the fine structure of aerosol distribution in the troposphere and stratosphere. The aerosol layered structure was observed in the Northern and Southern Hemispheres at heights of 0-18 km and 0-36 km, respectively. In both Hemispheres the aerosol fine structure possesses an

altitudinal periodicity of about 2.4-2.6 km. The ozone layers in the low stratosphere coincide with the aerosol layers or are shifted by 0.5 km down. Author

A92-44299
ANISOTROPY OF SPATIAL STRUCTURES IN THE MIDDLE ATMOSPHERE
G. M. GRECHKO, A. S. GURVICH, V. KAN, S. V. KIREEV (Russian Academy of Sciences, Institute of Atmospheric Physics, Moscow, Russia), and S. A. SAVCHENKO (Russian Academy of Sciences, Institute of Space Research, Moscow, Russia) (The earth's middle and upper atmosphere; Proceedings of the Topical Meeting of the Interdisciplinary Scientific Commission C /Meetings C6, C7, C9, C10 and C11/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-44276 18-46) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 10, Oct. 1992, p. 169-175. Oct. 1992 7 p refs
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In 1988-1989 a series of observations of star scintillations during star settings was carried out from the orbital station 'Mir'. These observations allow investigation of the fine spatial structure of temperature and density in the middle atmosphere. It was shown that the temperature and density inhomogeneities are strongly anisotropic. From measured spectra of star scintillations the vertical spectra of temperature fluctuations can be extracted. The horizontal structure of star scintillations was also studied. From these data an evaluation of the anisotropic coefficient of the temperature fluctuations of about 150 was obtained, utilizing the results of the derived vertical spectra. Strong anisotropy is typical for heights of 12 - 45 km. The analysis of 18 scintillation observations in the latitudes 32 deg N - 70 deg N and the longitudes 85 deg E - 154 deg E gives an estimation of temperature and density spectra variability. Aerosol distribution anisotropy was also studied by analyzing the earth's limb photograms during sunset with an MKF-6 camera from onboard the orbital station Salyut-6. The horizontal correlation scale of brightness fluctuations of light scattered by aerosols is about 100 times larger than the corresponding vertical one. Author

A92-46620
INTERACTION OF AN ELECTRON BEAM WITH THE IONOSPHERIC PLASMA IN THE ELEKTRON-1 ACTIVE EXPERIMENT [VZAIMODEISTVIE ELEKTRONNOGO PUCHKA S IONOSFERNOI PLAZMOI V AKTIVNOM EKSPERIMENTE 'ELEKTRON-1']
V. F. BYKOVSKII, S. B. GORIACHEV, A. A. DOROSHKIN, L. IU. KOCHMAREV, R. M. LAPIK, A. I. LIVSHITS, I. N. MESHKOV, V. N. MOZGUNOV, IU. A. ROMANOVSKII, L. N. SMIRNYKH (Rossiiskaia Akademiia Nauk, Fiziko-Tekhnologicheskii Tsentr, Russia) et al. Fizika Plazmy (ISSN 0367-2921), vol. 18, no. 5, May 1992, p. 595-602. In Russian. May 1992 8 p In RUSSIAN refs
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Experimental results are presented on the interaction of a 0.5 A, 6-8 keV electron beam with the ionospheric plasma. The experiment, which was carried out on the MR-12 rocket in October 1989 in the Volgograd area, studied plasma parameters in the vicinity of the rocket. It is found that the electron beam injection results in heating of plasma electrons with an energy of 75 eV and a density of about 10,000 per cu cm. Hot electrons seem to cause beam-plasma discharge and formation of plasma with a density of about 10 exp 6 per cu cm. During beam injection the rocket potential is not greater than +50 V. O.G.

A92-47943
EXPERIMENTS WITH SF6 INJECTION IN THE POLAR IONOSPHERE
IU. I. PORTNIAGIN, V. N. KORPUSOV, IU. K. CHASOVITIN, A. I. DEMIN, N. M. KLIUEVA, N. S. MIKHOVICH, and V. G. CHKALOV (NPO Taifun, Obninsk, Russia) Dec. 1992 5 p refs
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Three MR-20 rocket experiments with artificial 'electron hole' formations were carried out in September 1988 in the northern auroral zone on the research vessel 'Professor Vize'. The rockets were launched to investigate the upper atmospheric and ionospheric characteristics in the auroral region during substorms. Atmospheric parameters were measured by rocket-borne equipment inside the artificial cloud as well as outside it. The formation and development processes of artificial inhomogeneities and the influence of an admixture of anthropogenic origin on atmospheric characteristics are studied. Author

A92-47945
WAVE MEASUREMENTS IN ACTIVE EXPERIMENTS ON PLASMA BEAM INJECTION
V. N. ORAEVSKII, IU. IA. RUZHIN, V. G. KOROBEINIKOV, A. S. VOLOKITIN, and V. S. SKOMAROVSKII (IZMIRAN, Troitsk, Russia) Dec. 1992 4 p refs
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The paper presents the results and discussion of VLF wave measurements carried out in the course of two rocket experiments on the injection of a dense cesium ion beam into the ionosphere at heights of 165-240 km. The injection was accompanied by enhancement of the broadband noise by several orders of magnitude. The wave measurements in the frequency range of 1-11 kHz revealed two pronounced frequencies somewhat exceeding that of the lower-hybrid resonance oscillations in the background plasma and the cesium beam. The oscillations were modulated by frequencies close to the ion-cyclotron frequencies of the background plasma. Author

A92-47946
INVESTIGATION OF MAGNETOSPHERIC PROCESSES WITH THE USE OF A SOURCE OF STRONG MAGNETIC FIELD IN THE IONOSPHERE
A. S. BIRIUKOV, I. S. VESELOVSKII, O. R. GRIGORIAN (Moscow State University, Russia), A. D. KOVAL' (Research Institute of Machine Building, Kaliningrad, Russia), S. N. KUZNETSOV, A. P. KROPOTKIN, M. I. PANASIUK (Moscow State University, Russia), S. B. RIABUKHA (NPO Energiia, Kaliningrad, Russia), A. A. US, and V. A. SHUVALOV (Research Institute of Machine Building, Kaliningrad, Russia) Dec. 1992 7 p refs
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Attention is given to a spacecraft-based experiment examining the structure of a local formation such as an artificial 'magnetosphere' and the processes occurring in it, and the effects arising in the interaction of the moving magnetosphere with the ionospheric plasma. The corresponding space scales of this 'magnetosphere' are about 10 m in the experiment with relatively small magnets in the ionosphere and about 100 m in the solar wind. The corresponding similarity criteria are estimated. The possible scheme of the experiment with a superconducting magnet installed aboard the satellite is considered. The experimental complex includes a number of systems for measuring the fluxes of charged particles in a wide energy range, dc electric and magnetic fields, and the electromagnetic fields in different frequency bands. P.D.

A92-53861
THE ANGULAR AND SPATIAL DISTRIBUTION OF NEUTRON FLUXES MEASURED ON BOARD THE SALYUT-6 ORBITAL STATION [UGLOVOE I PROSTRANSTVENNOE RASPREDELENIE POTOKOV NEITRONOV, IZMERENNYKH NA STANTSII 'SALIUT-6']
V. I. LIAGUSHIN and P. I. SHAVRIN Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 30, no. 2, Mar.-Apr. 1992, p. 248-252. In Russian. Apr. 1992 5 p In RUSSIAN refs
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The angular distribution of albedo neutrons is estimated on the basis of measurements of neutron fluxes on board the Salyut-6 orbital station. The spatial distribution of neutrons over the area of the Brazil anomaly for an altitude of 350 km in 1979 is also adduced. P.D.

A92-53873
UNIDENTIFIED PHENOMENA - UNUSUAL PLASMA BEHAVIOR? [NEOPOZNANNYE IAVLENIIA - 'PRODELKI' PLAZMY?]
S. V. AVAKIAN (Gosudarstvennyi Opticheskii Institut, St. Petersburg, Russia) and V. V. KOVALENOK Priroda (ISSN 0032-874X), no. 6, June 1992, p. 72-77. In Russian. Jun. 1992 6 p In RUSSIAN refs
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The paper describes observations of a phenomenon belonging to the UFO category and the possible causes of these events. Special attention is given to an event which occurred during the night of September 19-20, 1974, when a huge 'star' was observed over Pertrozavodsk (Russia), consisting of a bright-white luminous center, emitting beams of light, and a less bright light-blue shell. The star gradually formed a cometlike object with a tail consisting of beams of light and started to descend. It is suggested that this event was related to cosmic disturbances caused by an occurrence of unusually strong solar flares. Other examples are presented that relate unusual phenomena observed in space to the occurrence of strong magnetic turbulence events. I.S.

A92-53950
COSMONAUTS EXPLORE THE EARTH [KOSMONAVTY ISSLEDUIUT ZEMLIU]
BORIS M. ZUBAREV, VLADIMIR V. KOZLOV, and VALENTIN V. LEBEDEV Moscow, Izdatel'stvo Nauka, 1991, 178 p. In Russian. 1991 178 p In RUSSIAN refs
(ISBN 5-02-002720-0) Copyright

Space-based geological experiments are reviewed with particular reference to the experiments conducted by the first crew of cosmonauts at the Salyut-7 orbital station as well as some data obtained during previous space missions. Various problems associated with space-based geological experiments and some results are reviewed, and the importance of in-orbit geological research is emphasized. The future prospects for this type of research are outlined. V.L.

A92-54231
DETERMINATION OF THE TURBULENT SPECTRUM IN THE IONOSPHERE BY A TOMOGRAPHIC METHOD
V. E. KUNITSYN (Moskovskii Gosudarstvennyi Universitet, Moscow, Russia) and E. D. TERESHCHENKO (Russian Academy of Sciences, Polar Geophysics Institute, Murmansk, Russia) (Wave and turbulence analysis techniques; URSI General Assembly, 23rd, Prague, Czechoslovakia, Aug. 1990, Selected Papers. A92-54225 23-46) Journal of Atmospheric and Terrestrial Physics (ISSN 0021-9169), vol. 54, no. 10, Oct. 1992, p. 1275-1282. Oct. 1992 8 p refs
Copyright

A theory of tomographic reconstruction of the statistical properties of the random turbulent ionospheric plasma is presented. Derived integral equations for the coherence functions of the measured fields allow the determination of inhomogeneous layer coordinates and the reconstruction of cross-sections of the electron density correlation functions. For statistically homogeneous layers and a transmitter on board a moving satellite with a linear receiving array on the ground, it is possible to determine the three-dimensional correlation function structure or its spectrum using a set of two-dimensional cross-sections. One receiver allows the reconstruction of the spectrum of the two-dimensional cross-section of the correlation function. The solution of the inverse problem for nonhomogeneous fluctuations is considered. In this case the distribution of the electron density fluctuations, its variance and the correlation coefficient, characterizing the spatial structure of fluctuations may be reconstructed by a tomographic technique. Experimental results on the identification of the layer height of the irregularities and on the spectrum of the two-dimensional cross-sections of the correlation function measurements are presented. Author

A92-54235
SMALL-SCALE FLUCTUATIONS OF MAGNETIC AND ELECTRIC COMPONENTS OF THE ELF AND VLF WAVE FIELDS IN THE SUB-AURORAL TOPSIDE IONOSPHERE - STOCHASTIC CHARACTERISTICS OF THE WAVE FIELD
IA. I. LIKHTER, V. I. LARKINA (IZMIRAN, Troitsk, Russia), and G. L. GDALEVICH (Russian Academy of Sciences, Institute of Space Research, Moscow, Russia) (Wave and turbulence analysis techniques; URSI General Assembly, 23rd, Prague, Czechoslovakia, Aug. 1990, Selected Papers. A92-54225 23-46) Journal of Atmospheric and Terrestrial Physics (ISSN 0021-9169), vol. 54, no. 10, Oct. 1992, p. 1311-1320. Oct. 1992 10 p refs
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N92-10557# Academy of Sciences (USSR), Moscow. Inst. of the Physics of the Earth.
INHOMOGENEITY AND NONLINEARITY EFFECTS ON STOP BANDS OF ALFVENIC ION CYCLOTRON WAVES IN MULTICOMPONENT PLASMA Abstract Only
A. K. NEKRASOV (Academy of Sciences (USSR), Moscow.), K. MURSULA (Oulu Univ. (Finland).), JORMA KANGAS (Oulu Univ. (Finland).), T. PIKKARAINEN (Oulu Univ., Finland), and N. F. MALTSEVA *In* Oulu Univ., Proceedings of the 25th Annual Conference of the Finnish Physical Society 1 p 1991 Previously announced in IAA as A91-25582
Avail: CASI HC A01/MF A03

The existence of stop bands for left handed Alfvenic ion cyclotron waves propagating in the direction of magnetic field in a multicomponent plasma is studied. Three effects are discussed: finite ion temperature, inhomogeneous magnetic field and nonlinear wave amplitude. All of them affect the existence of stop bands and set critical bounds on the relevant physical parameters, particularly on the density of heavy ions. Using the model of a linearly varying, longitudinally inhomogenous magnetic field, the critical lower bound on heavy ion density is calculated as a function of longitudinal inhomogeneity, and the difference between the truly inhomogeneous and essentially homogeneous situations is discussed. Typical values for the wave vector in the resonance region are derived. The upper bound on the wave amplitude for the linear theory to be applicable is found and the condition for stop band formation in the nonlinear case is derived. The obtained results are applied to the magnetospheric environment and shown to lead to relevant modifications. ESA

N92-12358# EG and G Energy Measurements, Inc., Los Alamos, NM.
WORKSHOP ON ARTIFICIALLY IONIZED LAYERS IN THE ATMOSPHERE Trip Report
T. W. TUNNELL 30 Oct. 1989 7 p Workshop held in Kiev, USSR, Oct. 1989
(Contract DE-AC08-88NV-10617)
(DE90-013470; EGG-10617-7002; LAO-2732-1856) Avail: CASI HC A02/MF A01

I presented our report which described our technique of inferring electron temperature in a microwave induced plasma. The primary purpose of my trip to Kiev was to present a paper entitled, Analysis of Nitrogen Light Emission from Artificially Ionized Layers (AIL) Breakdown, at the AIL workshop. The AIL concept is to produce an ionized layer in the atmosphere from which radio frequency waves can be reflected. The workshop provided for the transfer of unclassified technology between the US and the USSR, who are reportedly years, if not decades, ahead of the US in this area of research. DOE

N92-26300# Academy of Sciences (USSR), Leningrad. Arctic and Antarctic Research Inst.
POLAR CAP BOUNDARY AND STRUCTURE OF DAYSIDE CUSP AS DETERMINED BY ION PRECIPITATION
O. A. TROSHICHEV *In* ESA, Cluster Dayside Polar Cusp p 31-34 Dec. 1991
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 50 Dutch guilders

The results of particle measurements on board DMSP (Defense

Meteorological Satellite Program) F6 and F7 spacecraft show that the ion precipitation features in the auroral oval and in the polar cap are systematically diverse: the ion precipitation in the oval is of a smoothed character, whereas that in the polar cap is of a patchy type. The boundary between these two types of ion precipitation can usually be detected by a quick fall in the ion total number flux below some definite level. The polar cap identified in such a way has a shape of a roughly Sun aligned ellipse when IMF (Interplanetary Magnetic Field) is northward. Under the influence of the azimuthal IMF the northern polar cap is shifted toward the dusk (dawn) when B sub y is greater than 0 (B sub y is less than 0). In the southern polar cap the effect is opposite. The following structural zones in the dayside oval can be separated using the ion data: cusp, cusp core (near the noon meridian), poleward edge of the cusp, equatorward edge of the cusp. ESA

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METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

A92-12759
RELATIONSHIP BETWEEN THE OPTICAL CHARACTERISTICS OF CIRRUS CLOUDS AND THEIR TEMPERATURE AND GEOMETRICAL THICKNESS [O SVIAZI OPTICHESKIKH KHARAKTERISTIK PERISTYKH OBLAKOV S IKH TEMPERATUROI I GEOMETRICHESKOI TOLSHCHINOI]
P. P. ANIKIN (AN SSSR, Institut Fiziki Atmosfery, Moscow, USSR) and L. V. KRAVETS (Tsentral'naia Aerologicheskaia Observatoriia, Dolgoprudny, USSR) Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana (ISSN 0002-3515), vol. 27, Sept. 1991, p. 930-935. In Russian. Sep. 1991 6 p In RUSSIAN refs
Copyright

Data obtained during the Cirrus Clouds complex experiment during 1986-1989 are used to investigate the relationship between the optical characteristics (optical thickness and extinction coefficient) of clouds and their temperature and thickness. Dependences of the extinction coefficient in the visible region of the spectrum on the absorption coefficient in the IR wavelength range are obtained via calculations based on Mie theory. P.D.

A92-14277
PHYSICS OF THE ATMOSPHERIC BOUNDARY LAYER [FIZIKA POGRANICHNOGO SLOIA ATMOSFERY]
R. S. BORTKOVSKII, ED. and L. R. ORLENKO, ED. Leningrad, Gidrometeoizdat (Glavnaia Geofizicheskaia Observatoriia imeni A.I. Voeikova, Trudy, No. 530), 1991, 168 p. In Russian. No individual items are abstracted in this volume. 1991 168 p In RUSSIAN
Copyright

Results are presented on investigations of the boundary layer and the near-water surface layer, based on numerical modeling and analyses of experimental data. Special attention is given to results from a study of the wind-velocity structure over the sea surface; autooscillations in the ocean-atmosphere system due to the effect of cloud cover as a regulator with feedback control; and the parameterization of the barrier layer in an atmospheric boundary model. Consideration is also given to modeling the atmospheric boundary layer on the bank of a cooling reservoir; calculating the parameters of ice-glaze sediments using an atmospheric-boundary model; and the characteristics of the vertical wind distribution under conditions of breeze circulation. I.S.

A92-14310
ON THE FEASIBILITY OF RETRIEVING THE VERTICAL PROFILE OF THERMODYNAMIC TEMPERATURE IN CONVECTIVE CLOUDS BY USING A MICROWAVE RADIOMETER RADAR METHOD [O VOZMOZHNOSTI VOSSTANOVLENIIA VERTIKAL'NOGO PROFILIA TERMODINAMICHESKOI TEMPERATURY KONVEKTIVNYKH OBLAKOV SVCH-RADIOTEPLOLOKATSIONNO-RADIOLOKATSIONNYM METODOM]
KH. N. KARMOV IN: Physics of clouds and modification of hail processes 1990 5 p In RUSSIAN refs
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The paper describes a method for retrieving vertical profiles of thermodynamic temperature in convective clouds, using data on the thermal radio emission and radio-echo power obtained by a single-channel microwave-radiometer with a single channel or a two-channel radar. It was found that the most efficient and accurate results could be obtained using a single-channel microwave radiometer in conjunction with a single-channel radar. I.S.

A92-14316
THE ROLE OF THERMAL AND DYNAMIC FACTORS IN RESOLVING THE INSTABILITY ENERGY OF ATMOSPHERE [POL' TERMICHESKOGO I DINAMICHESKOGO FAKTOROV V RAZRESHENII ENERGII NEUSTOICHIVOSTI ATMOSFERY]
G. KH. BADAKHOVA, G. G. GORAL', L. G. KAPLAN, and L. M. FEDCHENKO IN: Physics of clouds and modification of hail processes 1990 8 p In RUSSIAN refs
Copyright

Results are presented of a comparative analysis of the conditions for the development of convective ascending motions in a thunderstorm-hail cloud. It is shown that the conditions for the air ascent in powerful air streams, unlike those in thermals, are determined not only by the buoyancy, but also by dynamic factors. An equation is developed that relates the air-motion velocity to the difference between the temperature and pressure inside the stream and those outside the stream. It is shown that the buoyancy at the stream base can be negative and that ascending motions are possible due to the difference between pressures inside and outside the stream. I.S.

A92-39465
THE MOMENTUM TURBULENT COUNTER-GRADIENT TRANSPORT IN JET-LIKE FLOWS
V. N. LYKOSOV (Rossiiskaia Akademiia Nauk, Otdel Vychislitel'noi Matematiki, Moscow, Russia) Advances in Atmospheric Sciences (ISSN 0256-1530), vol. 9, no. 2, May 1992, p. 191-200. May 1992 10 p refs
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Momentum countergradient diffusion in jetlike flows are studied by means of a stationary model based on the third-order closure scheme. The coupled effect of the curvature of the averaged wind-velocity profile and the gradient of the vertical velocity dispersion is employed to explain the existence of the momentum countergradient diffusion. The area of countergradient transport is shown to vary directly with the input of large-scale eddies, and observational data are presented which support the modeled results. The countergradient area forms above or below the jet axis depending on the sign of the gradient of the vertical velocity dispersion. The analytical results validate the semiempirical parameterization of the momentum countergradient diffusion for planetary boundary-layer models as developed by Lykossov (1990). C.C.S.

A92-40626
EFFECT OF CLOUDINESS ON THE VORTEX ACTIVITY IN THE ATMOSPHERE DURING CLIMATE CHANGES [O VLIIANII OBLACHNOSTI NA VIKHREVUIU AKTIVNOST' ATMOSFERY PRI IZMENENIIAKH KLIMATA]
I. I. MOKHOV, O. I. MOKHOV, V. K. PETUKHOV, and R. R. KHAIRULLIN (Rossiiskaia Akademiia Nauk, Institut Fiziki Atmosfery; VNII Fiziko-Tekhnicheskikh i Radiotekhnicheskikh Izmerenii,

Moscow; Kazanskii Gosudarstvennyi Universitet, Kazan, Russia) Meteorologiia i Gidrologiia (ISSN 0130-2906), no. 1, Jan. 1992, p. 5-11. In Russian. Jan. 1992 7 p In RUSSIAN refs
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Trends in the generation of vorticity in the atmosphere are examined in relation to cloudiness. A physical interpretation of the characteristics of cyclogenesis and anticyclogenesis at different latitudes of the Northern Hemisphere is proposed which is based on empirical data on their annual variability and a model of baroclinic vorticity generation with allowance for the effect of cumulus and stratus cloudiness. It is noted that the thermodynamic properties of cloudiness have a noticeable effect on the characteristics of vortex activity in the atmosphere. V.L.

A92-42740
EQUATIONS OF MOTION FOR A BALL LIGHTNING IN THE AIR STREAM OF A FLYING ROCKET [URAVNENIIA DVIZHENIIA SHAROVOI MOLNII V VOZDUSHNOM POTOKE LETIASHCHEI RAKETY]
N. I. GAIDUKOV Rossiiskaia Akademiia Nauk, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), no. 1, Jan.-Feb. 1992, p. 174-177. In Russian. Feb. 1992 4 p In RUSSIAN refs
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The hydrodynamic interaction between a ball lightning and a rocket moving along a certain trajectory under the thrust of its engines is investigated analytically, with the rocket modeled by a moving point source of variable intensity. The analysis yields a system of three ordinary differential equations. Although the system cannot be solved analytically in the general case, it can be solved numerically for specified initial conditions by representing it in the form of six first-order equations with given time functions. V.L.

A92-44084
USE OF THE TMS-65 HEATING EQUIPMENT AT AIRPORTS TO CREATE FOG-DISPERSAL ZONES ABOVE THE RUNWAY TO FACILITATE TAKEOFF [OB ISPOL'ZOVANII TEPLOVOI AERODROMNOI USTANOVKI TMS-65 S TSEL'IU SOZDANIIA ZONY PROSVETA V TUMANE NAD VPP DLIA VZLETA SAMOLETA]
I. M. ZAKHAROVA IN: Cloud physics and active modifications 1991 8 p In RUSSIAN refs
Copyright

The feasibility of using TMS-65 heating equipment to clear fog above runways is evaluated. The trajectory of the hot air jet emitted from the equipment is evaluated, and the number of such devices necessary to produce the required fog dispersal is determined. L.M.

A92-46645
THE DEPENDENCE OF ERRORS IN THE DETERMINATION OF TEMPERATURE PROFILES ON THE ACCURACY AND DISCRETENESS OF RADIOSONDE MEASUREMENTS [O ZAVISIMOSTI POGRESHNOSTEI OPREDELENIIA TEMPERATURNYKH PROFILEI OT TOCHNOSTI I DISKRETNOSTI RADIOZONDOVYKH IZMERENII]
G. V. VECHERUK IN: Methods and tools of atmospheric sounding 1990 9 p In RUSSIAN refs
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A method of optimal interpolation was used to determine the relationships between errors in air-temperature profile determinations and the accuracy and discreteness of radiosonde measurements, as well as the number of measurements. It is shown that the accuracy of temperature-profile determinations falls sharply with an increase of distance between measurements and that the number of measurements for optimal interpolation should be limited to four. I.S.

A92-46657
THE OPTICAL-BREAKDOWN AVALANCHE DEVELOPMENT CONSTANT IN MOIST AIR [POSTOIANNAIA RAZVITIIA LAVINY OPTICHESKOGO PROBOIA VO VLAZHNOM VOZDUKHE]
A. P. BUDNIK and A. S. VAKULOVSKII IN: Atmospheric optics 1990 5 p In RUSSIAN refs
Copyright

The propagation of intense laser radiation in the atmosphere can be accompanied by centers of optical breakdown arising near aerosol particles and at local inhomogeneities of the electromagnetic field. The paper presents results of calculations of the optical-breakdown avalanche development constant, the ionization frequency of molecules by electron impact, and the frequency of the dissociative attachment of electrons and attachment in three-particle collisions as a function of intensity and air moisture. It is shown that the optical-breakdown threshold in the troposphere in moist air can exceed the optical breakdown threshold of dry air by 20-30 percent. L.M.

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OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources.

A92-10910
INVESTIGATION OF THE ANISOTROPY OF THE ELECTRIC CHARACTERISTICS OF SEA ICE USING AIRBORNE RADAR SUBSURFACE-SOUNDING [ISSLEDOVANIE ANIZOTROPII ELEKTRICHESKIKH KHARAKTERISTIK MORSKOGO L'DA S POMOSHCH'IU RADIOLOKATSIONNOGO PODPOVERKHNOSTNOGO ZONDIROVANIIA S BORTA SAMOLETA]
M. I. FINKEL'SHTEIN, P. D. DAN'SHIN, and A. N. PESHKOV Radiotekhnika i Elektronika (ISSN 0033-8494), vol. 36, Aug. 1991, p. 1425-1430. In Russian. Aug. 1991 6 p In RUSSIAN refs
Copyright

Radar-sounding data on the anisotropy of the electric characteristics of one-year-old sea ice in the horizontal plane are presented. It is shown that the ratio of amplitudes of orthogonally polarized signals reflected from the lower ice boundary reaches a value of 8 dB. Anisotropy is found to be most characteristic of one-year-old ice with a mean thickness ranging from 70 to 120 cm. L.M.

A92-25333
DETERMINATION OF THE CONCENTRATION OF PHYTOPLANKTON CHLOROPHYLL IN THE OCEAN FROM MEASUREMENTS FROM THE MIR ORBITAL STATION IN THE CARIBE-88 EXPERIMENT [OPREDELENIE KONTSENTRATSII KHLOROFILLA FITOPLANKTONA V OKEANE PO IZMERENIIAM S ORBITAL'NOI STANTSII 'MIR' V EKSPERIMENTE 'KARIBE-88']
V. V. BADAEV, L. N. VASIL'EV, V. N. PELEVIN, V. L. SOLOMAKHA, and G. TSIMMERMAN (AN SSSR, Institut Kosmicheskikh Issledovanii and Institut Geografii and Institut Okeanologii, Moscow, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Sept.-Oct. 1991, p. 47-55. In Russian. Oct. 1991 9 p In RUSSIAN refs
Copyright

Phytoplankton chlorophyll and admixture concentration in sea water are determined. Results were obtained via research-vessel-based biological and optical measurements, as well as spaceborne measurements of brightness, with consideration for atmospheric correction of surface images, obtained during the Caribe-88 experiment using MKS-M instrumentation and methods. The applicability of these methods to remote study of the ocean and coastal waters is shown. P.D.

A92-25351
VARIABILITY OF THE SPECTRAL BRIGHTNESS COEFFICIENT IN THE OCEAN-ATMOSPHERE SYSTEM IN THE VISIBLE RANGE ACCORDING TO INTERCOSMOS-21 SATELLITE DATA [IZMENCHIVOST' KOEFFITSIENTA SPEKTRAL'NOI IARKOSTI SISTEMY OKEAN-ATMOSFERA V VIDIMOM DIAPAZONE PO DANNYM IZMERENII S ISZ 'INTERKOSMOS-21']
V. S. SUETIN and S. P. SHUTIKOV (AN Ukrainy, Morskoi Gidrofizicheskii Institut, Sevastopol, Ukraine) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Nov.-Dec. 1991, p. 3-11. In Russian. Dec. 1991 9 p In RUSSIAN refs
Copyright
The factor analysis method is used to investigate the variability of the spectral brightness coefficient in the ocean-atmosphere system in the visible range for a fixed elevation angle of the sun. Results of simulation and processing of Intercosmos-21 satellite data on the water area of the open ocean are compared. It is shown that the entire variability may be described by two factors pertaining to the optical properties of water and the atmosphere. Spectral dependences of each factor's contribution to the results of the measurements are obtained. P.D.

N92-10272# Academy of Sciences (USSR), Moscow. Space Research Inst.
RADIOHYDROPHYSICAL AEROSPACE RESEARCH OF OCEAN
V. S. ETKIN, M. D. RAEV, M. G. BULATOV, YU. A. MILITSKY, A. V. SMIRNOV, V. YU. RAIZER, YU. A. TROKHIMOVSKY, V. G. IRISOV, A. V. KUZMIN, K. TS. LITOVCHENKO et al. 1991 84 p
(SRI-PR-1749) Avail: CASI HC A05/MF A01
A review of theoretical and experimental papers devoted to microwave, infrared, and optic remote sensing of ocean is presented. The active and passive techniques and tools and their application to such physical parameters and phenomena as sea surface temperature, near surface wind, sea wave spectra, waves breaking, internal waves in ocean and atmosphere, surface and internal waves nonlinear interactions, sea currents, hydrological fronts, etc., are considered. Author

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LIFE SCIENCES (GENERAL)

A92-20830
BIOLOGICAL ROLE OF GRAVITY - HYPOTHESES AND RESULTS OF EXPERIMENTS ON 'COSMOS' BIOSATELLITES
ALEKSEI M. ALPATOV, VSEVOLOD V. ANTIPOV, and MURAD G. TAIRBEKOV (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (Life sciences and space research XXIV/1/ - Gravitational biology; Proceedings of the Symposia 10 and 13 of the Topical Meeting of the Interdisciplinary Scientific Commission F /Meetings F1 and F2/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-20827 07-51) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 1, 1992, p. 27-32. 1992 6 p refs
Copyright
To determine the biological significance of gravity, microgravity effects have been studied at the cellular, organism and population levels. Attention is given to whether cell adaptation to weightlessness is possible, whether any gravity-dependent processes exist in a cell, and whether the integral characteristics of living beings change in weightlessness. These questions are addressed from a theoretical viewpoint, and using results obtained in experiments aboard Cosmos biosatellites. R.E.P.

A92-20839
THE ROLE OF CELLULASES IN THE MECHANISM OF CHANGES OF CELL WALLS OF FUNARIA HYGROMETRICA MOSS PROTONEMA AT CLINOSTATING
E. M. NEDUKHA (AN USSR, Institut Botaniki, Kiev, Ukrainian SSR) (Life sciences and space research XXIV/1/ - Gravitational biology; Proceedings of the Symposia 10 and 13 of the Topical Meeting of the Interdisciplinary Scientific Commission F /Meetings F1 and F2/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-20827 07-51) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 1, 1992, p. 99-102. 1992 4 p refs
Copyright
Using biochemical and electroncytochemical techniques, differences between the cytochemical reaction intensity and activity of the cellulosolytic enzymes in Funaria hygrometrica moss cells grown for 30 days in a horizontal clinostat (2 rev/min) and in a control are presented. It is shown that on clinostating, the precipitate size and amount increases with the cellulase activity enhancement in the periplasmic space and protonema cell walls, when compared to the control. Data obtained on the possible mechanism of cellulase activation and synthesis inhibition and cellulose crystallization in plant cell walls in the case of clinostating are discussed. R.E.P.

A92-20840
PECULIARITIES OF THE SUBMICROSCOPIC ORGANIZATION OF CHLORELLA CELLS CULTIVATED ON A SOLID MEDIUM IN MICROGRAVITY
K. M. SITNIK, A. F. POPOVA (AN USSR, Institut Botaniki, Kiev, Ukrainian SSR), G. S. NECHITAILO (NPO Energiia, Moscow, USSR), and A. L. MASHINSKII (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (Life sciences and space research XXIV/1/ - Gravitational biology; Proceedings of the Symposia 10 and 13 of the Topical Meeting of the Interdisciplinary Scientific Commission F /Meetings F1 and F2/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-20827 07-51) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 1, 1992, p. 103-107. 1992 5 p refs
Copyright
A study was conducted of the submicroscopic organization of Chlorella vulgaris cells grown over 30 days on a solid agarized medium aboard the Mir orbital station. Comparative cytological analysis shows general regularities of rearrangements of the submicroscopic organization in Chlorella cells cultivated on both semiliquid and solid agarized nutrient media. R.E.P.

A92-20845
STRUCTURAL AND FUNCTIONAL ORGANISATION OF REGENERATED PLANT PROTOPLASTS EXPOSED TO MICROGRAVITY ON BIOKOSMOS 9
D. A. KLIMCHUK, E. L. KORDIUM, L. A. DANEVICH, E. B. TARNAVSKAIA (AN USSR, Institut Botaniki, Kiev, Ukrainian SSR), M. G. TAIRBEKOV (Institut Mediko-Biologicheskikh Problem, Moscow, USSR), T.-H. IVERSEN, C. BAGGERUD (Trondheim, University, Norway), and O. RASMUSSEN (Aarhus, University, Denmark) (Life sciences and space research XXIV/1/ - Gravitational biology; Proceedings of the Symposia 10 and 13 of the Topical Meeting of the Interdisciplinary Scientific Commission F /Meetings F1 and F2/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-20827 07-51) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 1, 1992, p. 133-140. 1992 8 p refs
Copyright
Preparatory tests for the IML-1 mission utilizing plant protoplasts were flown on a 14 day flight aboard Biocosmos 9 during September 1989. Ultrastructural and fluorescence analysis of cell aggregates from hypocotyl cells of rapeseed and suspension cultures of carrot protoplasts, cultured under microgravity conditions, was performed. The processes of cell proliferation and differentiation under microgravity did not differ significantly from those under normal gravity conditions. Various aspects of utilizing isolated protoplasts

for clarifying the mechanisms of biological effects of micro-g are discussed. R.E.P.

A92-25402
PILEATE MUSHROOMS AND ALGAE - OBJECTS FOR SPACE BIOLOGY [SHLIAPOCHNYE GRIBY I VODOROSLI: OB'EKTY KOSMICHESKOI BIOLOGII]
L. F. GOROVOI, T. B. KASATKINA, A. F. POPOVA, and E. L. KORDIUM Leningrad, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Vol. 69), 1991, 232 p. In Russian. 1991 232 p In RUSSIAN refs
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Methods are described for investigating the growth and development of pileate mushrooms and blue-green and monocellular green algae under conditions of space flight. Particular attention is given to special installations (Kvadrat and Trapezia) constructed for growing several generations of mushrooms and algae under microgravity or other extreme conditions such as ionizing radiation, UV light, magnetic fields, and for studies of these effects on growth of mushrooms and algae. Results are presented on morphological, cytological, and biochemical effects of microgravity and hypogravity in mushrooms and algae. I.S.

A92-26021
BASIC APPROACHES TO SPACECRAFT STUDIES OF THE BIOLOGICAL EFFECT OF HEAVY IONS OF GALACTIC COSMIC RAYS [OSNOVNYE PODKHODY K IZUCHENIIU BIOLOGICHESKOGO DEISTVIIA TIAZHELYKH IONOV GALAKTICHESKIKH KOSMICHESKIKH LUCHEI V ISSLEDOVANIIAKH NA KOSMICHESKIKH APPARATAKH]
L. V. NEVZGODINA and E. N. MAKSIMOVA Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 55-57. In Russian. Dec. 1991 3 p In RUSSIAN refs
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It is argued that the basic approach that should be adopted in investigations of the biological effect of heavy-ion radiation (HIR) from galactic cosmic rays is the analysis of final manifestations of radiobiological reactions, such as cell inactivation and cell death (rather than merely the rate of mutation or the rate of appearance of aberrant cell structures). The choice of biological objects for studying the effect of HIR should be dictated by the feasibility of studying, in the particular object, the amount of injury and the rate of recovery both on the cellular and the organism levels. It is emphasized that the viability of the metabolic apparatus should be measured not only under optimal conditions of enzyme reactivity but also under conditions of extreme temperatures, overload, vibration, pressure, and humidity. I.S.

A92-26022
ANALYSIS OF THE PROTEIN CONTENT IN BLOOD PLASMA OF RATS AFTER THEIR FLIGHT ABOARD THE BIOSATELLITE COSMOS-1887, USING TWO-DIMENSIONAL ELECTROPHORESIS [ANALIZ BELKOVOGO SOSTAVA PLAZMY KROVI KRYS POSLE POLETA NA BIOSPUTNIKE 'KOSMOS-1887' S ISPOL'ZOVANIEM METODA DVUKHMERNOGO ELEKTROFOREZA]
O. N. LARINA Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 57, 58. In Russian. Dec. 1991 2 p In RUSSIAN refs
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The effect of a space flight on the total protein content and on individual proteins of rat blood plasma was investigated by analyzing plasma proteins of rats flown for 12.5 days aboard Cosmos-1887, using the Anderson and Anderson method of 2D electrophoresis. A comparison of data obtained before and after flight with data on synchronous controls showed that, while the total protein contents of experimental rats and ground controls were similar, the concentrations of albumin in flown rats decreased and those of globulin increased. Four of the flown rats (of the total group of nine) displayed increases of basic polypeptides analogous in the position to the alpha-chain of human fibrinogen. The same samples showed abnormal distributions of proteins among various molecular weight subfractions. I.S.

A92-28384
ULTRASTRUCTURAL ORGANIZATION OF CHLORELLA CELLS CULTIVATED ON A SOLID MEDIUM IN MICROGRAVITY [UL'TRASTRUKTURNA ORGANIZATSIIA KLITIN KHLORELI, VIROSHCHENIKH NA TVERDOMU POZHIVNOMU SEREDOVISHCHI V UMOVAKH MIKROGRAVITATSII]
A. F. POPOVA, K. M. SITNIK, E. L. KORDIUM, G. S. NECHITAILO, and O. L. MASHINS'KII (AN URSR, Institut Botaniki, Kiev, Ukrainian SSR) Akademiia Nauk Ukrains'koi RSR, Dopovidi, Matematika, Prirodoznavstvo, Tekhnichni Nauki (ISSN 0868-8052), Aug. 1991, p. 154-157. In Ukrainian. Aug. 1991 4 p In UKRAINIAN refs
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Chlorella cells grown for 30 days on board the Mir space station are found to differ from the control cells in their ultrastucture and relative volumes of the organelles and cell inclusions. Some of these changes are observed only in the chlorella cells cultivated on a solid medium. The observed changes in the submicroscopic organization of the chlorella cells grown on a solid medium in microgravity must be taken into account in developing techniques for plant growth in space. V.L.

A92-33751
DEVELOPMENT OF ISOLATED PLANT CELLS IN CONDITIONS OF SPACE FLIGHT (THE PROTOPLAST EXPERIMENT) [RAZVITIE IZOLIROVANNYKH RASTITEL'NYKH KLETOK V USLOVIIAKH KOSMICHESKOGO POLETA /EKSPERIMENT 'PROTOPLAST'/]
M. G. TAIRBEKOV (Institut Mediko-Biologicheskikh Problem, Moscow, Russia), E. L. KORDIUM, D. A. KLIMCHUK (AN Ukrainy, Institut Botaniki, Kiev, Ukraine), O. A. ZABOTINA, V. V. LOZOVAIA (Rossiiskaia Akademiia Nauk, Institut Biologii, Kazan, Russia), K. BAGGERUD, T.-H. IVERSEN (Trondheim, University, Norway), O. RASMUSSEN (Aarhus University, Denmark), and F. GMUNDER (Zuerich, Eidgenoessische Technische Hochschule, Zurich, Switzerland) Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia (ISSN 0002-3329), Jan.-Feb. 1992, p. 5-17. In Russian. Feb. 1992 13 p In RUSSIAN refs
Copyright

Results are presented from the Soviet-ESA experiment Protoplast, in which the effect of a space flight (aboard Cosmos 2044) on the development of protoplasts isolated from 6-day-old hypocotyls of rape (Brassica napus) sprouts and from cultured carrot (Daucus carota) cells was investigated by postflight examinations of the rape and carrot cells. It was found that, compared with cells that developed on ground, the cells that developed in space had a reduced metabolic activity and exhibited changes of morphological and functional characteristics, including the chemical composition of cell-wall components, decreased protein contents, decreased peroxidase activity, and alterations of cell ultrastructure. Possible mechanisms responsible for these effects are discussed. I.S.

A92-39131
HYPONORADRENERGIC SYNDROME OF WEIGHTLESSNESS - ITS MANIFESTATIONS IN MAMMALS AND POSSIBLE MECHANISM
I. B. KRASNOV (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-23 to S-26. Feb. 1991 4 p refs

The paper examines the mechanism(s) underlying the microgravity-induced hypofunction of pituitary somatotrophs and thyreotrophs, which are the two major causes of the various observable physiological effects of weightlessness. Literature data are presented which suggest a hyponoradrenergic mechanism underlying the hypofunction of the pituitary somatotrophs and

thyreotrophs during weightlessness. The following sequence of events is suggested: (1) a decrease during a space flight of the flow of vestibular and proprioceptive impulses to the vestibular nuclei along the vestibular and spinovestibular fibers lowers the level of impulses from vestibular nuclei to noradrenergic neurons of the locus ceruleus, (2) this event in turn decreases the activating effect of the locus-ceruleus noradrenergic neurons upon pituitary somatotrophs and thyreotrophs. I.S.

A92-39138
THE MONKEY IN SPACE FLIGHT
E. A. IL'IN, V. I. KOROL'KOV, I. B. KOZLOVSKAIA, V. I. LOBACHIK, and A. N. TRUZHENNIKOV (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-49 to S-51. Feb. 1991 3 p

Results are presented from studies on two primates during their two-week space flights on board Cosmos-1887 and Cosmos-2044, in which quantitative data on the status of the cardiovascular system, conditional reflex activity, body fluids, and metabolism were collected for each subject. It is suggested that changes of some physiological parameters observed after flight in these monkeys should be considered as an adaptive response to the effect of weightlessness. For instance, after the flight, a new level of hydration homeostasis formed, with a lower content of body fluids. I.S.

A92-39139* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
CELLULAR IMMUNITY AND LYMPHOKINE PRODUCTION DURING SPACEFLIGHTS
I. V. KONSTANTINOVA (Institute of Biomedical Problems, Moscow, Russia), G. SONNENFELD (Louisville, University, KY), A. T. LESNIAK (Institute of Biomedical Problems, Moscow, Russia), L. SHAFFAR (Institut National de la Sante et de la Recherche Medicale, Nice, France), A. MANDEL (NASA, Ames Research Center, Moffett Field, CA), M. P. RYKOVA, E. N. ANTROPOVA (Institute of Biomedical Problems, Moscow, Russia), and B. FERRUA (Institut National de la Sante et de la Recherche Medicale, Nice, France) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-52 to S-56. Feb. 1991 5 p refs

Results are presented on changes in cellular immunity and in the production of lymphokine in spacecrews during spaceflights. Measurements were carried out on blood samples collected from 50 cosmonauts before and after spaceflights of different duration, on board Salyut-6, Salyut-7, or Mir. Additional data were obtained from rats flown on board the Cosmos-1667 and Cosmos-1887 biosatellites. The parameters measured included the PHA responsiveness of T lymphocytes, the activity of T-helper cells and of nonspecific T suppressors, the activity of the so-called natural killer lymphocytes, the production of gamma-interferon, and the cell-surface markers. Results showed that the frequency and the extent of changes in the immunologic resistance of subjects depended on the duration of the flight. However, even after the most prolonged (365 days) spaceflight, the changes observed were mostly of a functional character with subsequent rapid return to normal. I.S.

A92-39149
GRAVITATIONAL BIOLOGY EXPERIMENTS ABOARD THE BIOSATELLITES 'COSMOS NO.' 1887 AND NO. 2044
A. M. ALPATOV, M. G. TAIRBEKOV, and I. A. USHAKOV (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-78, S-79. Feb. 1991 2 p refs

The effect of microgravity on the growth dynamics of animal and plant biological systems was investigated using Protozoans, cell cultures, plants, flat worms, and amphibians. It was found that microgravity only slightly stimulated or inhibited some biological processes, but the effects remained within the normal range of biological response. No qualitative unfavorable effects of microgravity were detected. I.S.

A92-39156
PROTEIN COMPOSITION IN HUMAN PLASMA AFTER LONG-TERM ORBITAL MISSIONS AND IN RODENT PLASMA AFTER SPACEFLIGHTS ON BIOSATELLITES 'COSMOS-1887' AND 'COSMOS-2044'
O. N. LARINA (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-94, S-95. Feb. 1991 2 p refs

The effect of long-duration spaceflights on the composition of plasma proteins was investigated in two crewmembers of a 367-day mission and in two crewmembers of a 167-day mission aboard the Soyus-Mir complex and in rats flown aboard Cosmos-1887 and Cosmos-2044 biosatellites, using results of 2D electrophoresis. The 2D maps of crewmembers, obtained the day after the recovery, show manifold increases in the contents of several proteins seen normally in trace amounts, as well as the appearance of several unusual protein spots. Rats flown aboard Cosmos-1887 exhibited higher levels of fibrinogen (compared to vivarium controls) two days after landing; however, rats flown on Cosmos-2044 exhibited no difference from controls. It is suggested that the observed abnormalities in plasma proteins could have been caused by gravitational stress applied by return to earth conditions. I.S.

A92-39170
HYPERGRAVITY AND DEVELOPMENT OF MAMMALS
L. V. SEROVA (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-135, S-136. Feb. 1991 2 p refs

The effects of microgravity and hypergravity on the development of organs in embryo and in young and adult mammals are compared using literature data. It was found that the general patterns of changes in the developmental response due to gravity changes by either plus or minus 1G of the ground gravity were very similar, despite the opposite direction of the gravity change. The results demonstrate the contribution of a nonspecific stressor component to the mammalian responses to gravitation changes, and indicate that centrifuge experiments can be used for studies of the effect of weightlessness. I.S.

A92-39171
FUNCTIONAL MORPHOLOGY OF PITUITARY IN RATS DEVELOPED UNDER INCREASED WEIGHTNESS AND RELATIVELY DECREASED WEIGHTNESS
E. I. ALEKSEEV and I. B. KRASNOV (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-137, S-138. Feb. 1991 2 p refs

The effects of hypergravity (centrifugation at 2 G) and the change to relative hypogravity (1 G) on the development of the pituitary of rats were investigated in 60-day-old animals developed pre- and postnatally under 2G and then exposed to 1G, by analyzing the functional statuses of somato-, thyro-, and gonadotrophs of the anterior pituitary as well as the neurosecretory structures of the posterior pituitary. Histochemical examinations of rats grown under 2 G revealed a marked hypofunction of adenohypophysial cells and a low baseline level of functioning of the neurosecretory

structure. On day 2 after the transition to 1 G, there were signs of an activation of somato-, thyro-, and gonadotrophs and a release of an ADH-containing neurosecretion. I.S.

A92-39175
STUDIES OF CIRCADIAN RHYTHMS IN SPACE FLIGHT - SOME RESULTS AND PROSPECTS
A. M. ALPATOV (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-145, S-146. Feb. 1991 2 p refs

The effect of space flight on the circadian rhythm stability of insects and mammals was investigated using data collected on beetles, rats, and primates flown aboard the Cosmos-1514, -1667, and -1887 boisatellites. The analyses of data on the deviations of circadian periods of body-temperature and motor-activity rhythms indicate that, as a result of space flight, the stability of the circadian rhythm decreases and a shift of the endogenous circadian period occurs. It is pointed out that both these effects should result in a high chance of desynchronosis in space flights. I.S.

A92-39177
INVESTIGATION OF HEART RATE AND BODY TEMPERATURE DYNAMICS DURING A 14 DAYS SPACEFLIGHT EXPERIMENT 'COSMOS 2044'
J. DRESCHER, A. M. ALPATOV, V. I. KOROL'KOV, A. N. TRUZHENNIKOV, Y. A. EVSTRATOV, V. IA. KLIMOVITSKII, H. WEISSLEDER, K. H. DRUEE, V. S. MAGEDOV, and S. A. USACHEV (Berlin, Humboldt-Universitaet, Federal Republic of Germany; Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-149, S-150. Feb. 1991 2 p refs

The effect of microgravity on the body temperature dynamics and the heart rate (HR) was investigated in a monkey equipped with a biotelemetric temperature measuring system and flown aboard Cosmos-2044 for 14 days. Results of the biorhythm analyses indicated a decrease of the circadian rhythm stability (lower significance level) and the presence of phase shifting in both parameters. I.S.

A92-39194
ULTRASTRUCTURAL CHARACTERISTICS OF PLASTIC CHANGES IN THE BRAIN CORTEX OF RATS EXPOSED TO SPACE FLIGHT
L. N. D'IACHKOVA (Russian Academy of Sciences, Institute of Animal Evolutionary Morphology and Ecology, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-185, S-186. Feb. 1991 2 p

The effect of spaceflights on different regions of the rat brain cortex was investigated by examining the ultrastructures of the somatosensory, visual, and olfactory cortex regions from rats flown for 7 days aboard Cosmos 1667 or for 14 days aboard Cosmos-1887 or -2044 biosatellites, as well as from rats of the ground-based synchronous control and vivarium groups. It was found that the changes in the ultrastructure which developed due to spaceflights were similar for all the brain-cortex regions under study. The differences were mainly due to the extent of the observed changes, the distribution density of the changed structures, and the specific features of their localization in the corresponding brain areas. I.S.

A92-39200
EFFECTS OF A TWO-WEEK SPACE FLIGHT ON OSTEOINDUCTIVE ACTIVITY OF BONE MATRIX IN WHITE RATS
D. D. SUMAROKOV, D. V. GUTKIN, V. M. OGNIVENKO, V. M. KUDYMOV (Moscow Medical Stomatological Institute, Russia), V. S. OGANOV, and A. V. BAKULIN (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-200, S-201. Feb. 1991 2 p refs

The hypothesis of Sumarokov (1987), according to which the biochemical and morphological alterations of the bone tissue in spaceflight are due changes in the contents of 'osteoinductive factors' and 'osteoinhibiting factors', was tested by estimating the contents of these factors in the bone tissue of rats flown for 14 days aboard Cosmos-2044 and of rats kept in tail suspension. The method used in these assays is based on the estimation of the potency of to induce ectopic osteogenesis by bone tissue samples taken from experimental and from control rats and transplanted into m. pectoralis major and m. quadriceps femoris of intact rats. It was found that, compared with the vivarium and synchronous controls, rats exposed to spaceflight and simulated-microgravity conditions exhibited increased rates of ectopic osteogenesis and reduced potency to inhibit osteogenesis. I.S.

A92-39202
FUNCTIONAL AND ADAPTIVE CHANGES IN THE VESTIBULAR APPARATUS IN SPACE FLIGHT
D. V. LYCHAKOV (Rossiiskaiia Akademiia Nauk, Institut Evoliutsionnoi Fiziologii i Biokhimii, St. Petersburg, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-204, S-205. Feb. 1991 2 p refs

Results are presented from several studies on the effects of weightlessness and hypergravity on the morphological and biochemical characteristics in the vestibular apparatus. These experiments used frog larvae, fish larvae, and adult rats flown in space for 7 to 9 days; young fish subjected to 1.8-2 G centrifugation for 4 months; rats subjected to centrifugation at 2G for a month; and Rhesus monkeys kept in horizontal position under klinostatic or antiorthostatic hypokinetic conditions. Results show that the exposure to weightlessness does not produce pathological changes in the structural organization of vestibular receptors. However, changes in gravity were found to produce some functional and adaptive structural rearrangements in the otolith organs and in cristae. I.S.

A92-51500 National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
EFFECT OF SPACEFLIGHT ON NATURAL KILLER CELL ACTIVITY
MARINA P. RYKOVA, GERALD SONNENFELD, A. T. LESNIAK, GERALD R. TAYLOR, DIMITRII O. MESHKOV, ADRIAN D. MANDEL, ANDREI E. MEDVEDEV, WALLACE D. BERRY, BORIS B. FUCHS, and IRINA V. KONSTANTINOVA (Institute of Biomedical Problems; Russian Academy of Medical Sciences, Institute of Human Morphology, Moscow, Russia; Louisville, University, KY; NASA, Johnson Space Center, Houston, TX; NASA, Ames Research Center, Moffett Field, CA) Journal of Applied Physiology, Supplement (ISSN 8750-7587), vol. 73, no. 2, Aug. 1992, p. 196S-200S. Aug. 1992 5 p refs
(Contract NAG2-614)
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The effects of spaceflight on immune cell function were determined in rats flown on Cosmos 2044. Control groups included vivarium, synchronous, and antiorthostatically suspended rats. The ability of natural killer cells to lyse two different target cell lines was determined. Spleen and bone marrow cells obtained from flight rats showed significantly inhibited cytotoxicity for YAC-1 target cells compared with cells from synchronous control rats. This could have been due to exposure of the rats to microgravity. Antiorthostatic suspension did not affect the level of cytotoxicity

from spleen cells of suspended rats for YAC-1 cells. On the other hand, cells from rats flown in space showed no significant differences from vivarium and synchronous control rats in cytotoxicity for K-562 target cells. Binding of natural killer cells to K-562 target cells was unaffected by spaceflight. Antiorthostatic suspension resulted in higher levels of cytotoxicity from spleen cells for Cr-51-labeled K-562 cells. The results indicate differential effects of spaceflight on function of natural killer cells. This shows that spaceflight has selective effects on the immune response. Author

A92-55712
CONSIDERATION FOR BIOMEDICAL SUPPORT OF EXPEDITION TO MARS
A. I. GRIGOR'EV, V. M. PETROV, A. N. POTAPOV, and E. N. SVETAILO (Institute of Biomedical Problems, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 6 p. Aug. 1992 6 p refs
(IAF PAPER 92-0275) Copyright

Medical techniques and technologies based on the support used for two Soviet missions are considered with respect to an extended Martian expedition. Attention is given to the needs for onboard preventive, diagnostic, and therapeutic measures including surgery and a crewmember who can function as a medical doctor. The need for psychological monitoring and diagnosis is established, and the biomedical implications of life-support systems are discussed. Significant risks are associated with the exposure to radiation in space including Galactic cosmic rays. The development of automated medical and life-support control systems is concluded to be both important and effective based on Soviet space experience. Hazard assessment for radiation risks and the development of biological and hybrid life-support systems are identified as two key areas of research. C.C.S.

N92-13083# Joint Publications Research Service, Arlington, VA.
RESULTS FROM PLANT GROWTH EXPERIMENTS ABOARD ORBITAL STATIONS
A. VOLKOV, S. KRIKALEV, and G. NECHITAYLO *In its* JPRS Report: Science and Technology. USSR: Space p 28-29 30 Jul. 1990 Transl. into ENGLISH from Pravda, Moscow (USSR), 22 Oct. 1989 p 3
Avail: CASI HC A01/MF A01

A general description of research involving plant growth experiments aboard U.S.S.R. orbital space stations is given. Weightlessness effects, gravitational effects, and the plant development cycle in relation to life support systems are briefly discussed. The development of a new polymer material, polyacrylamide gel, is described. Other experiments with animal and plant tissues are described. Author

N92-14577# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES
22 Oct. 1991 54 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-91-019) Avail: CASI HC A04/MF A01

Abstracts of Soviet publications in various areas of the life sciences are presented. The areas covered include: biochemistry, biophysics, pharmacology, toxicology, and virology. K.S.

N92-14578# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES
28 Oct. 1991 65 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-91-020) Avail: CASI HC A04/MF A01

Translations are presented from several Russian technical publications. They are divided under several general topics, including the following: agricultural science; biochemistry; biophysics; epidemiology; genetics; immunology; laser bioeffects; medicine; microbiology; molecular biology; pharmacology, toxicology; physiology; public health; radiation biology; and virology. E.R.

N92-14579# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES
13 Nov. 1991 31 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-91-021) Avail: CASI HC A03/MF A01

Translations are presented of articles from several Russian publications. They are headed under several general topics including the following: agricultural science; biochemistry; biotechnology; genetics; medicine; microbiology; pharmacology, toxicology; physiology; and virology. E.R.

N92-14580# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES
19 Nov. 1991 49 p Transl. into ENGLISH of various Russian articles
(JPRS-ULS-91-022) Avail: CASI HC A03/MF A01

Abstracts of Soviet publications in various areas of the life sciences are presented. The areas covered include: military medicine and public health. K.S.

N92-14581# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES
26 Nov. 1991 62 p Transl. into ENGLISH of various Russian articles
(JPRS-ULS-91-023) Avail: CASI HC A04/MF A01

Abstracts of Soviet publications in various areas of the life sciences are presented. The areas covered include: aerospace medicine, epidemiology, and public health. K.S.

N92-14582# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES
29 Nov. 1991 47 p Transl. into ENGLISH of various Russian articles
(JPRS-ULS-91-024) Avail: CASI HC A03/MF A01

Abstracts of Soviet publications in various areas of the life sciences are presented. The areas covered include: laser bioeffects, medicine, microbiology, and radiation biology. K.S.

N92-22287# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: LIFE SCIENCES
13 Feb. 1992 45 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-92-006) Avail: CASI HC A03/MF A01

A bibliography is given of science and technology research in Central Eurasian countries. Topics covered include biochemistry, biophysics, epidemiology, genetics, immunology, clinical medicine, microbiology, pharmacology, toxicology, physiology, public health, radiation biology, and virology. Author

N92-22288# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: LIFE SCIENCES
11 Feb. 1992 98 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-92-005) Avail: CASI HC A05/MF A02

A bibliography is given of science and technology research research in Central Eurasian countries in science and technology. Topics covered include agricultural science, biochemistry, environment, epidemiology, genetics, medicine, pharmacology, toxicology, physiology, public health, psychology, radiation biology, and veterinary medicine. Author

N92-22306# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: LIFE SCIENCES
28 Feb. 1992 34 p Transl. into ENGLISH of various Russian articles
(JPRS-ULS-92-008) Avail: CASI HC A03/MF A01

A bibliography is given of Central Eurasian research in life

sciences. Topics covered include agriculture, biotechnology, immunology, laser treatment of cancer patients, microbiology, radiation effects, physiology, public health, radiation biology, and veterinary biology. Author

N92-22307# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES
23 Dec. 1991 66 p Transl. into ENGLISH of various Russian articles
(JPRS-ULS-91-025) Avail: CASI HC A04/MF A01

A bibliography of USSR research in life sciences is given. Topics covered include biophysics, epidemiology, immunology, laser bioeffects, medicine, microbiology, physiology, public health, and radiation biology. Author

N92-22308# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: LIFE SCIENCES
14 Jan. 1992 82 p Transl. into ENGLISH of various Russian articles
(JPRS-ULS-92-002) Avail: CASI HC A05/MF A01

A bibliography is given of Central Eurasian research in life sciences. Topics covered include medicine, microbiology, pharmacology, toxicology, physiology, public health, radiation biology, veterinary medicine, and virology. Author

N92-22309# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: LIFE SCIENCES
28 Jan. 1992 55 p Transl. into ENGLISH of various Russian articles
(JPRS-ULS-92-003) Avail: CASI HC A04/MF A01

A bibliography is given of Central Eurasian research in life sciences. Topics covered include aerospace medicine, agriculture, biotechnology, epidemiology, laser effects, military medicine, toxicology, physiology, public health, psychology, and virology. Author

N92-22311# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: LIFE SCIENCES
30 Jan. 1992 33 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-92-004) Avail: CASI HC A03/MF A01

A bibliography of Central Eurasian research in life sciences is given. Topics covered include agriculture, biochemistry, epidemiology, immunology, physiology, public health, and virology. Author

N92-22391# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: LIFE SCIENCES
9 Mar. 1992 34 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-92-009) Avail: CASI HC A03/MF A01

A bibliography is given of Central Eurasian research in the life sciences. Topics covered include aerospace medicine, agriculture, biotechnology, epidemiology, genetics, laser bioeffects, microbiology, pharmacology, physiology, public health, and radiation biology. Author

N92-22393# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES
3 Jan. 1992 31 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-92-001) Avail: CASI HC A03/MF A01

A bibliography is given of U.S.S.R. research in life sciences. Topics covered include agriculture, biochemistry, biotechnology, epidemiology, genetics, immunology, industrial medicine, and laser biophysics. Author

N92-23706# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: LIFE SCIENCES
26 Mar. 1992 46 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-92-010) Avail: CASI HC A03/MF A01

A bibliography is given of Central Eurasian research in life sciences. Topics covered include biochemistry, biophysics, biotechnology, the Earth environment, radiation effects, genetics, immunology, clinical medicine, microbiology, pharmacology, toxicology, physiology, public health, psychology, radiation biology, veterinary medicine, and virology. Author

N92-26979# Academy of Sciences (USSR), Krasnoyarsk. Inst. of Biophysics.
CHEMOLITHOTROPIC HYDROGEN-OXIDIZING BACTERIA AND THEIR POSSIBLE FUNCTIONS IN CLOSED ECOLOGICAL LIFE-SUPPORT SYSTEMS
T. G. VOLOVA, J. G. GITELSON, F. Y. SIDKO, and I. N. TRUBACHEV *In* ESA, 4th European Symposium on Space Environmental Control Systems, Volume 2 p 811-815 Dec. 1991
Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

Results of experimental studies of chemolithotrophic hydrogen oxidizing bacteria (hydrogen bacteria and carboxidotrophic bacteria) are surveyed. The data on growth and nutrition physiology of these microorganisms and physiological characteristics, correlated with the growth conditions, are given. Prospects to apply chemolythotrophs as producers of biosynthesis target products and as a feasible link in a closed human life support system are discussed. The prospects of applying the culture of Alkaligenes eutrophus hydrogen bacteria to perform a number of basic functions of a regeneration component in a closed life support system are analyzed. These functions include: the utilization of the carbonic acid exhaled by man; the reclamation of water and utilization of human exometabolites; and the reclamation of the nutrient substances, mainly the protein component of the diet. ESA

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

A92-18210
EFFECTS OF PROLONGED HYPOKINESIA AND WEIGHTLESSNESS ON THE FUNCTIONAL STATE OF SKELETAL MUSCLES IN HUMANS - USE OF AN ELECTROMECHANICAL EFFICIENCY CRITERION [VLIIANIE DLITEL'NOI GUPOKINEZII I NEVESOMOSTI NA FUNKTSIONAL'NOE SOSTOIANIE SKELETNYKH MYSHTS CHELOVEKA - OPYT ISPOL'ZOVANIIA KRITERIIA ELEKTROMEKHANICHESKOI EFFEKTIVNOSTI]
V. S. OGANOV, V. S. GURFINKEL', V. G. KOZLOVA, A. S. RAKHMANOV, and V. S. MAGEDOV (Institut Mediko-Biologicheskikh Problem; AN SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 17, July-Aug. 1991, p. 35-47. In Russian. Aug. 1991 13 p In RUSSIAN refs
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The effects of prolonged hypokinesia and weightlessness on the physiological state of skeletal muscles were investigated in humans subjected to prolonged antiorthostatic hypokinesia (182 days of staying in bed or 3 days of water immersion) or to 140 to 175 days of orbital flight, by measuring the dynamics of changes in electromyographic parameters of m. gastrocnemius and m. tibialis anterior before and after the exposures. Some subjects received supplementary salt additions and were performing exercises in

order to test the effect of antihypokinesia measures. As a criterion of the physiological state of a muscle, an inverse function of the electromyographic integral energy, termed the electromechanical efficiency (EME) criterion, was used. It was found that the EME criterion describes well the changes in basic physiological characteristics of a muscle observed during hypokinesia. I.S.

A92-18545
MAJOR MEDICAL RESULTS OF EXTENDED FLIGHTS ON SPACE STATION MIR IN 1986-1990
A. I. GRIGOR'EV, S. A. BUGROV, V. V. BOGOMOLOV, A. D. EGOROV, V. V. POLIAKOV, I. K. TARASOV, and E. B. SHUL'ZHENKO (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) IAF, International Astronautical Congress, 42nd, Montreal, Canada, Oct. 5-11, 1991. 7 p. Oct. 1991 7 p refs
(IAF PAPER 91-547) Copyright

In 1986-1990 seven prime spacecrews (16 cosmonauts) flew on board Mir orbital complex. The longest duration of space mission was 366 days. Microgravity effects on the cardiovascular, motor, endocrine, blood, immune and metabolic were studied. The performed investigations point to the human possibility to adapt well to a year-long stay in space and to maintain good health and adequate performance. The readaptation has occurred in a similar way as it was after other long-term space flight up to 8 months in duration. Author

A92-18549
CIRCULATION AND FLUID ELECTROLYTE BALANCE IN EXTENDED SPACE MISSIONS
A. I. GRIGOR'EV and A. D. EGOROV (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) IAF, International Astronautical Congress, 42nd, Montreal, Canada, Oct. 5-11, 1991. 15 p. Oct. 1991 15 p refs
(IAF PAPER 91-552) Copyright

This paper presents the results of studies and possible mechanisms underlying changes of human circulation and fluid electrolyte balance in long duration space missions. Circulation changes were measured at rest, in response to graded exercise tests and lower body negative pressure tests. Fluid electrolyte balance before and after flight was measured with reference to changes in plasma electrolytes, spontaneous renal excretion of fluids and electrolytes in response to water and water salt supplements. Author

A92-20860
CIRCADIAN RHYTHMS IN A LONG-TERM DURATION SPACE FLIGHT
ALEKSEI M. ALPATOV (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (Life sciences and space research XXIV/1/ - Gravitational biology; Proceedings of the Symposia 10 and 13 of the Topical Meeting of the Interdisciplinary Scientific Commission F /Meetings F1 and F2/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-20827 07-51) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 1, 1992, p. 249-252. 1992 4 p refs
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The effect of long-duration isolation on the endogenous free-running circadian-rhythm (CR) period tau (which may be different from 24 hr, depending on individual and environmental parameters) was investigated. Four humans were placed singly in isolation for about 1 month and had to obey a strict 'diurnal' schedule, with a regular 8-hr shift of operator work, but following their own biological clock instead of a watch. As a result, all subjects, in spite of their full impression of living in subjective 24-hr day, demonstrated an elongation of the circadian period to an about 25-hr rhythm, suggesting that, in long-term space flights, a 25-hr day may be preferable to a 24-hr day. Results of biorhythm studies aboard the Cosmos manned satellites disclosed a lower stability of CRs in space and a shift of CR in microgravity, both leading to higher hazard of CR desynchronization. These results suggest that, in long-term space flights, a 25-hr day may be preferable to a 24-hr day and that a flexible work/rest schedule coordinated with CRs of the crew via a biofeedback loop would be beneficial. I.S.

A92-20869
SUMMING-UP COSMONAUT PARTICIPATION IN LONG-TERM SPACE FLIGHTS
A. I. GRIGOR'EV (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (Life sciences and space research XXIV/1/ - Gravitational biology; Proceedings of the Symposia 10 and 13 of the Topical Meeting of the Interdisciplinary Scientific Commission F /Meetings F1 and F2/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-20827 07-51) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 1, 1992, p. 323-328. 1992 6 p refs
Copyright

Observations related to physiological changes in humans during space flights are examined in detail. Medical results obtained in short- and long-term space missions indicate that a man can adequately adapt and efficiently work in space for as long as a year. Physiological changes detected in flight were adaptive, adequate to the space flight environment, and reversible. They did not deteriorate the work capacity of the crewmembers. O.G.

A92-20872
SOME MEDICAL ASPECTS OF AN 8-MONTH'S SPACE FLIGHT
O. IU. ATKOV (All-Union Cardiology Research Center, Moscow, USSR) (Life sciences and space research XXIV/1/ - Gravitational biology; Proceedings of the Symposia 10 and 13 of the Topical Meeting of the Interdisciplinary Scientific Commission F /Meetings F1 and F2/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-20827 07-51) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 1, 1992, p. 343-345. 1992 3 p
Copyright

Results of medical experiments performed on the Salyut-7-Soyuz-T orbital complex and the Mir station are briefly discussed with particular attention given to cardiovascular studies and hematological examinations. It is concluded that an increase in flight time to eight months produced no qualitatively new physiological changes as compared to the previous prolonged flights. O.G.

A92-26004
EXTERNAL RESPIRATION AND GAS EXCHANGE DURING SPACE FLIGHTS [VNESHNEE DYKHANIE I GAZOOBMEN V KOSMICHESKIKH POLETAKH]
V. M. BARANOV, M. A. TIKHONOV, N. M. ASIAMOLOVA, M. IU. VOLKOV, A. N. KOTOV, G. E. SAVCHENKO, and K. S. KHAIDAKOV Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 4-8. In Russian. Dec. 1991 5 p In RUSSIAN refs
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Using results obtained in earlier space flights and simulated flight studies, the effects of microgravity, acceleration, and changes in the composition and pressure of the spacecraft-cabin and the space suit atmospheres on the parameters of the respiratory function of humans are examined. It is shown that the effects include changes in the respiration biomechanics, the gas-diffusion and ventilation-perfusion ratios in lungs, the regulation of respiration and of respiratory muscles, the degrees of the hydration and blood filling of lungs, and the acid-base equilibrium and blood gases. In addition, a combination of these effects may cause functional and morphological changes in the lung tissue. I.S.

A92-26006
HEMATOLOGIC INDICES IN COSMONAUTS DURING A SPACE FLIGHT [GEMATOLOGICHESKIE POKAZATELI U KOSMONAVTOV V USLOVIIAKH KOSMICHESKOGO POLETA]
M. P. KALANDAROVA, V. V. POLIAKOV, I. B. GONCHAROV, and L. IU. TIKHONOVA Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 11-14. In Russian. Dec. 1991 4 p In RUSSIAN refs
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The effect of space flight on hematologic indices of the space crew was investigated in crew members of the third and the fourth prime crew flights (EO-3 and EO-4). It was found that hematological parameters in the subjects were not affected by the space flight, indicating the intactness of the blood regeneration system during these periods. However, some changes were recorded in the numbers of neutrophils, myelocytes, and lymphocytes; also observed were erythrocytic hypochromia and anisocytosis. A comparison of the results of preflight and postflight bone-marrow examinations revealed slight increases in lymphocytosis, monocytosis, and plasma-cell counts as a result of space flight. I.S.

A92-26015
NUCLEASE ACTIVITY OF MICROORGANISMS AND THE PROBLEM OF MONITORING THE STATE OF AUTOMICROFLORA IN OPERATORS IN HERMETICALLY SEALED ENVIRONMENTS [NUKLEAZNAIA AKTIVNOST' MIKROORGANIZMOV I PROBLEMA KONTROLIA ZA SOSTOIANIEM AUTOMIKROFLORY OPERATOROV GERMETICHNO ZAMKNUTYKH OB'EKTOV]
N. A. POLIKARPOV, A. N. VIKTOROV, and A. F. KHALANGOT Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 39-42. In Russian. Dec. 1991 4 p In RUSSIAN refs
Copyright

The safety, with respect to microbial infections, of operators working in hermetically sealed environments such as space vehicles and underwater chambers was considered by investigating the DNA and/or RNA activities of microbial pathogens (Shigella, Salmonella, and Staphylococcus aureus) and potential microbial pathogens in three groups of subjects: (1) clinically healthy subjects with normal microflora, (2) somatic patients with intestinal dysbacteriosis, and (3) patients with acute intestinal diseases. Results of microscopic examinations and of nuclease assays of samples from these subjects showed that the critical size of depolymerization zones of nucleic acids in the gel media were significantly different for normal and for potentially pathogenic intestinal microorganisms. I.S.

A92-26018
ASSESSMENT OF THE HEALTH STATUS AND THE CHARACTERISTICS OF METABOLISM IN COSMONAUTS DURING A PROLONGED SPACE FLIGHT [OTSENKA SOSTOIANIIA ZDOROV'IA I OSOBENNOSTEI OBMENA VESHCHESTV U KOSMONAVTOV V USLOVIIAKH DLITEL'NOGO KOSMICHESKOGO POLETA]
A. I. GRIGOR'EV, V. V. POLIAKOV, V. B. NOSKOV, and V. I. KOZHARINOV Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 48, 49. In Russian. Dec. 1991 2 p In RUSSIAN refs
Copyright

The effect of a long-term (up to 200 days) space flight on the biochemical indices of cosmonauts' blood was investigated using minute quantities of blood drawn from the finger tip of the subjects and analysis by means of special diagnostic strips and an instrumental system (Reflotron) that was adopted to the conditions of space flight. The results of microanalyses were correlated and were used to assess the conditions of metabolism and to make diagnoses of metabolic abnormalities in the myocardium, liver, pancreas, and other organs. I.S.

A92-34191
THE EFFECTS OF PROLONGED SPACEFLIGHTS ON THE HUMAN BODY
ANATOLII I. GRIGOR'EV and ANATOLII D. EGOROV (Institute of Biomedical Problems, Moscow, Russia) IN: Advances in space biology and medicine. Vol. 1 1991 35 p refs
Copyright

The components and major factors of the mechanisms responsible for physiological changes in human body due to the effects of microgravity in space are examined. Special attention is given to the effect of a prolonged spaceflight on the vestibular system, the motor and skeletal systems, the cardiovascular system, the endocrine and metabolic system, the blood components, and the immune system. Results of medical investigations of long-term missions showed that humans can adequately adapt and work efficiently in space for as long as a year. Good health condition and adequate work capacity may be enhanced by various measures, such as various countermeasures to the adverse effects of microgravity, a comfortable environment, sufficient sleep and rational work-rest cycles, a well-balanced nutrition, and a proper selection of crews. I.S.

A92-39134
GRAVITATIONAL ASPECTS OF THERMOREGULATION AND AEROBIC WORK CAPACITY
N. G. LAKOTA, V. V. POLIAKOV, and V. S. SHASHKOV (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-32 to S-35. Feb. 1991 4 p refs

Results are presented on suit immersion (SI) experiments, in which physical efficiency and endurance data for human subjects were collected before and after SI, and SI and orbital flight experiments in which data on body thermoregulation were obtained. Results suggest that body temperature is a gravity-dependent factor. It is suggested that one of the ways of maintaining the heat status and the capability for energy formation of subjects in space may be the administration of such physiologically active compounds as indirect sympathomimetics, neuroactive amino acids, metabolites, adaptogens, and preparations that normalize mineral metabolism. I.S.

A92-39135
PATHOGENESIS OF SENSORY DISORDERS IN MICROGRAVITY
L. N. KORNILOVA, A. M. GONCHARENKO, G. BODO, K. ELKAN, V. GRIGOROVA, and A. MANEV (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-36 to S-39. Feb. 1991 4 p refs

Results are presented from investigations of the pattern and the etiology of sensory disorders observed in crewmembers participating in the spaceborne experiments Optokinesis (Kornilova et al., 1987) and Labyrinth (Grigorova et al., 1989). These experiments addressed spontaneous oculomotor reactions and reactions elicited by vestibular, visual, and combined vestibulovisual stimulation. It was found that all subjects could be divided into three types: type I, subjects whose responses to all stimuli were distinct; type II, subjects with weak or absent responses to all stimuli; and type III, subjects whose responses to stimuli varied and included changes in the role of sensory inputs. I.S.

A92-39137
MEDICAL RESULTS OF THE MIR YEAR-LONG MISSION
A. I. GRIGOR'EV, S. A. BUGROV, V. V. BOGOMOLOV, A. D. EGOROV, I. B. KOZLOVSKAIA, I. D. PESTOV, V. V. POLIAKOV, and I. K. TARASOV (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-44 to S-48. Feb. 1991 5 p

Results are presented from a year-long (December 21, 1987 through December 21, 1988) manned mission performed aboard the Soviet orbital complex Mir-Soyuz-TM-Quant-Progress. The crew consisted of two members who performed experiments designed to monitor changes in general body and health characteristics, cardiovascular parameters, the motor system, bone loss, metabolic parameters, and visceral organs; a graded exercise test on a bicycle ergometer and LBNP measurements were also performed. In

addition, changes induced by EVA were obtained, including those in the carbohydrate and lipid metabolism, serum-enzyme activities, and fluid-electrolyte metabolism. Other experiments involved monitoring of changes in the hormonal status, blood parameters, and immune reactivity. It was found that changes observed in vital physiological systems after one year in space were not different from those reported for shorter flights. Moreover, some changes were even less significant. I.S.

A92-39144
ADRENERGIC REGULATION AND MEMBRANE STATUS IN HUMANS DURING HEAD-DOWN HYPOKINESIA (HDT)
A. I. GRIGOR'EV, S. M. IVANOVA (Institute of Biomedical Problems, Moscow, Russia), R. K. BLUMA, I. E. KALNINJA, and V. N. SOMINSKII (Riga Medical Institute, Latvia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-66, S-67. Feb. 1991 2 p

The status of erythrocyte cellular membrane and the responsiveness of erythrocytes to adrenergic hormones were investigated in two groups (A and B) of human subjects exposed to 370-day-long head-down-tilt (HDT, at 6 deg) hypokinesia followed by a recovery period. In group A, HDT bed rest was combined with daily exercise and pharmacological drugs as countermeasures, while group-B subjects were using countermeasures only from day 120. The parameters measured were changes in binding of fluorescent DSM, amounts of catecholamines in urine and blood, fatty acid composition of membrane phospholipids, transport ATPase activity, intracellular contents of K(+) and Na(+), and the rate of K(+) leakage. Results indicated that, although the countermeasures had a certain corrective effect, they failed to prevent the alterations in erythrocyte membranes caused by HDT (which included changes in the activity of membrane-bound ATPase, the membrane permeability and charge, and the density and rigidity of its lipid bilayer). I.S.

A92-39158
EVALUATION OF ENERGY METABOLISM IN COSMONAUTS
I. A. POPOVA, E. G. VETROVA, and L. A. RUSTAMIAN (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-98, S-99. Feb. 1991 2 p

The effect of microgravity on the metabolism of humans was investigated in 27 cosmonauts after flights of 8 to 366 days aboard Salyut and in 39 subjects exposed to dry water immersion, bed rest, or head-down tilt for 6 to 370 days. Results of analyses of biochemical parameters of blood serum and plasma of subjects flown for 8 to 10 days showed significant increases of insulin, creatine phosphokinase (CPK), CPK-MM, and malate dehydrogenase-3 (MDH3), as well as decreases in glucose, lactate, MDH1, MDH2, and T3. Cosmonauts flown for 7-8 months exhibited significant decreases in triglycerides, and variations in MDH and isocytrate. Experiments with simulated microgravity showed that many changes consistently seen postflight develope at an early stage of exposure. I.S.

A92-39179
ABOUT THE GREAT IMPORTANCE OF VENOUS BLOOD CIRCULATION IN THE PATHOGENESIS OF SPACEMAN STATE DISTURBANCES IN WEIGHTLESSNESS
V. A. DEGTIAREV, V. N. RAGOZIN, T. V. BATENCHUK-TUSCO, S. A. KIRILLOVA, E. A. KOBZEV, and V. V. KALINICHENKO (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-153 to S-155. Feb. 1991 3 p refs

The effect of long-term space flights on the central venous pressure (CVP) of humans was investigated by measuring CVP of cosmonauts before, during, and after spaceflights of up to 11-month duration aboard the orbital station Mir, using a specially developed method. Results indicated that the CVP values of cosmonauts in space were higher by about 50 percent than those observed on earth. After 20 min of recovery on earth, the CVP values decreased to values about 45 percent below the original level. It was found that physical training and the application of clumping cuffs were effective as countermeasures. I.S.

A92-39210
SENSORY INTERACTION AND METHODS OF NON-MEDICINAL PROPHYLAXIS OF SPACE MOTION SICKNESS
G. S. AIZIKOV, IU. V. KREIDICH, and R. A. GRIGORIAN (Institute of Biomedical Problems, Moscow, Russia) (International Union of Physiological Sciences Commission on Gravitational Physiology, Annual Meeting, 12th, Leningrad, USSR, Oct. 14-18, 1990, Proceedings. A92-39126 16-51) Physiologist, Supplement (ISSN 0031-9376), vol. 34, no. 1, Feb. 1991, p. S-220 to S-223. Feb. 1991 4 p refs

Data are presented from experiments on animals and humans, demonstrating the peculiarity of sensory interaction under varying experimental conditions including microgravity. These experiments included studies on the effects of electromyostimulation, vibrostimulation, and voluntary muscle tension on the toleration of Coriolis rotation test; studies of the comparative effects of drug (scopolamine), and nondrug (autotraining with feedback and voluntary muscular tension) prophylactic methods against experimental motion sickness; and studies of the effect of the compensation support unloading induced by microgravity. I.S.

A92-57280
MEDICAL MONITORING IN LONG-TERM SPACE MISSIONS - THEORY AND EXPERIENCE
A. I. GRIGOR'EV and A. D. EGOROV (Institute of Biomedical Problems, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 13 p. Aug. 1992 13 p refs
(IAF PAPER 92-0895) Copyright

A conceptual diagnosis model for extended space missions is described, and the state-of-the-art methods of medical monitoring onboard the Mir station are discussed. Particular attention is given to the classification of clearly defined adverse syndromes induced by microgravity effects and possible health disorders associated with equipment failures. O.G.

N92-11616# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES Abstracts Only
7 Oct. 1991 65 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-91-017) Avail: CASI HC A04/MF A01

Translations from various Russian publications are presented. The areas of general interest are as follows: aerospace medicine; biophysics; biotechnology; epidemiology; immunology; microbiology; physiology; public health; radiation biology; and virology. Some titles of interest are listed as follows: Effects of Prolonged Space Flight on Erythrocyte Metabolism and Membrane Functional Condition; Efficacy of Hyperbaric Oxygenation in Enhancing Flight Tolerance; Toxicity Assessment of Combustion Products in Simulated Space Cabins; and Technical Requirements of Sick Bays Aboard Space Ships.

N92-11617# Joint Publications Research Service, Arlington, VA.
EFFECT OF PROLONGED SPACE FLIGHT ON ERYTHROCYTE METABOLISM AND MEMBRANE FUNCTIONAL CONDITION Abstract Only
S. M. IVANOVA, S. S. BRANTOVA, O. I. LABETSKAYA, G. S. ARZAMAZOV, N. V. DELENYAN, and T. I. TURKINA *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 1 7 Oct. 1991 Transl. into ENGLISH from Kosmicheskaya Biologiya

i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 24, no. 6, Nov. - Dec. 1990 p 18-23
Avail: CASI HC A01/MF A01

Erythrocyte metabolism was assessed in two cosmonauts following 326 day (cosmo 1) and 160 day (cosmo 2) space flights. Studies on day 1 after landing revealed marked depression of erythrocyte glycolysis and reduced ATP levels in both cosmonauts. On day 9, glycolysis and ATP had returned to baseline levels in cosmo 2, but continued to decline in cosmo 1. Changes in erythrocyte membranes included a significant increase in free cholesterol and cholesterol esters on day 9, while phospholipids were reduced. Furthermore, phosphatidyl ethanolamine showed a significant reduction and an increase in lysophosphatydyl choline in cosmo 1, while cardiolipin was elevated in both cosmos. Further metabolism alterations included a reduction of membrane Na(+), K(+) -ATPase and an increase in Ca(2+), Mg(2+)-ATPase activities. In addition, in the immediate post-flight period the erythrocytes displayed enhanced resistance to acid hemolysis. These observations showed that space flight conditions have a profound effect on the metabolic and physiological status of erythrocytes, resulting in reduced deformability. Accordingly, appropriate measures should be used in-flight and post-flight to insure normal erythrocyte function. Author

N92-11619# Joint Publications Research Service, Arlington, VA.
TOXICITY ASSESSMENT OF COMBUSTION PRODUCTS IN SIMULATED SPACE CABINS Abstract Only
V. F. USHAKOV, G. I. SOLOMIN, V. P. SAVINA, S. S. PASHIN, L. V. MARCHENKO, A. I. GORSHUNOVA, E. I. CHUKHNO, V. M. ZINOVYEV, N. YE. OSTASHEVA, YE. A. DEMCHENKO et al. *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 4 7 Oct. 1991 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 24, no. 6, Nov. - Dec. 1990 p 58-60
Avail: CASI HC A01/MF A01

The toxicity of the combustion products of polymers used in transformers was assessed on outbred albino rats and mice in simulated space cabins. Polyamide-6 and getinaks represented 81.4 pct. of the polymers in the transformer by weight. The resultant data indicated that within the testing parameters, unambiguous toxicity was lacking. It also became apparent that tests reflecting function of the nervous system are the most sensitive indicators of toxicity. Furthermore, tolerance of combustion products may be best assessed by determining the level of hepatic detoxication. The experiments also showed that within a cabin volume of 80 cu m, the concentrations of the most toxic products (hydrocyanic acid, carbon monoxide, ammonia, hydrogen fluoride, and formaldehyde) produced by a transformer fire remained below threshold limit values. Smaller cabins, accordingly, would present greater toxicity risks even on short term exposure. Author

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A92-20873
SELECTION AND BIOMEDICAL TRAINING OF COSMONAUTS
S. A. BUGROV, L. I. VORONIN, IU. I. VORONKOV, M. M. KOROTAEV, and IU. A. SENKEVICH (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (Life sciences and space research XXIV/1/ - Gravitational biology; Proceedings of the Symposia 10 and 13 of the Topical Meeting of the Interdisciplinary Scientific Commission F /Meetings F1 and F2/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-20827 07-51) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 1, 1992, p. 347-350. 1992 4 p refs
Copyright

A Soviet concept of cosmonaut selection and training based on twenty-eight years experience of supporting the safety of manned space missions is reviewed. Major stages of medical selection system and biomedical preparation of cosmonauts for long-duration missions are discussed. It is concluded that the existing systems for selection and biomedical training made it possible to provide safety for space missions lasting up to a year. Training programs aimed at cosmonaut preparation for long-duration interplanetary flights will reflect a significant shift toward biomedical aspects. O.G.

A92-26005
INVESTIGATION OF MENTAL WORK CAPACITY OF COSMONAUTS ABOARD THE MIR ORBITAL COMPLEX [ISSLEDOVANIE PSIKHICHESKOI RABOTOSPOSOBNOSTI KOSMONAVTOV NA ORBITAL'NOM KOMPLEKSE 'MIR']
K. K. IOSELIANI, A. L. NARINSKAIA, SH. R. KHISAMBEEV, and G. RADKOVSKI Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 8-11. In Russian. Dec. 1991 4 p In RUSSIAN refs
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In the framework of the Prognoz experiment, changes in the mental performance occurring after 3 to 5 days of stay aboard Mir and 190 days after the mission, were evaluated in four cosmonauts visiting the station, using a computer-based psychodiagnostic unit Pleven-87. Mental performance was estimated from the ability of the subject to quickly solve the following problems: continuous counting in optimal, prescribed, or self-regulated rhythm; a complex sensorimotor reaction having psychological feedback; a conditional motor reaction to several combinations of color stimuli; and a reaction to a moving object. Results demonstrated the ability of the Pleven-87 system to provide reliable predictions concerning the mental work capacity of cosmonauts. All subjects demonstrated high mental stability during and after the flight. I.S.

A92-55724
INTERNATIONAL CREW SELECTION AND TRAINING FOR LONG-TERM MISSIONS
A. ALEKSANDROV (NPO Energiia, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 5 p. Aug. 1992 5 p
(IAF PAPER 92-0294) Copyright

The selection and training of 'cosmonaut researchers' for long-term space station missions is discussed, with special attention given to the training and selection of members of international crews. It is suggested that all cosmonaut researchers should know the theory of all facilities to be used during space flight and be trained in using the facilities on the transportation vehicle and the orbital station and in performing scientific experiments; they should also undergo training in low-pressure chamber and training for the activities after splashdown. The paper lists particular systems of which a foreign cosmonaut researcher for a space station mission should have the knowledge and skills to operate; the fields of education from which these crew members might be selected; and the medical tests that should be passed by prospective crew members. At present, two candidates have started training at the Yu. A. Gagarin Cosmonauts Training Center. I.S.

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A92-13801
MEASUREMENT OF THE RADIATION DOSE ON THE MIR STATION DURING SOLAR PROTON EVENTS IN SEPTEMBER-OCTOBER 1989 [IZMERENIE DOZY RADIATSII NA STANTSII 'MIR' VO VREMIA SOLNECHNYKH PROTONNYKH SOBYTII V SENTIABRE-OKTIABRE 1989 G.]
L. V. TVERSKAIA, M. V. TEL'TSOV, and V. I. SHUMSHUROV (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Geomagnetizm i Aeronomiia (ISSN 0016-7940), vol. 31, Sept.-Oct. 1991, p. 928-930. In Russian. Oct. 1991 3 p In RUSSIAN refs
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An analysis is made of variations of the radiation dose of the Mir orbital station under exposure to solar cosmic rays during September-October 1989. It is shown that increases in the dose which represent a significant radiation hazard are associated with approach of the solar-proton penetration boundary toward the earth during strong magnetic disturbances. L.M.

A92-20864
HUMAN FACTOR IN MANNED MARS MISSION
EVGENII A. IL'IN, SERGEI F. KHOLIN, VADIM I. GUSHCHIN, and IURII R. IVANOVSKII (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (Life sciences and space research XXIV/1/ - Gravitational biology; Proceedings of the Symposia 10 and 13 of the Topical Meeting of the Interdisciplinary Scientific Commission F /Meetings F1 and F2/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-20827 07-51) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 1, 1992, p. 271-279. 1992 9 p refs
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The specific human-factor-related problems that are expected to arise in a manned mission to Mars are discussed together with the approaches designed for the resolution of these problems. Special attention is given to the concept of multifunctional on-board instrumental and informational medical complex for a Martian spacecraft. The medical complex designed for Mars missions consists of a mainframe computer, a physician's computerized work station, an operator's computerized work station, a unified registrar of biophysical information, the facilities for physiological testing and training and for biophysical correction, and an individual autonomous recorder and transmitter of biophysical information. The operation principles of the complex are discussed, and its functional scheme is presented. I.S.

A92-20989
BIOLOGICAL LIFE-SUPPORT SYSTEMS FOR MARS MISSION
IOSIF I. GITEL'SON (AN SSSR, Institut Biofiziki, Krasnoyarsk, USSR) (Life sciences and space research XXIV/4/ - Natural and artificial ecosystems; Proceedings of the Topical Meeting of the Interdisciplinary Scientific Commission F /Meetings F10, F11, F1 and F12/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-20969 07-54) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 5, 1992, p. 167-192. 1992 26 p refs
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A comparison of biological and physical/chemical life-support systems (LSSs) is made in the context of a Martian mission with reference to experimental methods. A biological LSS and the basic subsystems are presented, and the feasibility is discussed of continuously cultivating algae. A second biological LSS is described which relies on the use of hydrogen-oxidizing bacteria for air and H2O regeneration. The last biological LSS is discussed in which agricultural plants are utilized, and the three systems are intercompared and contrasted with physical/chemical LSSs. Technological feasibility is established for the biological LSSs based on the use of single-cell organisms, and the importance is emphasized of the selection of the energy source. It is recommended that an international consortium develop physical/chemical and biological LSSs in parallel for subsequent comparison and selection. C.C.S.

A92-26016
BIOCATALYSIS USING IMMOBILIZED CELLS OR ENZYMES AS A METHOD OF WATER AND AIR PURIFICATION IN A HERMETICALLY SEALED HABITAT [BIOKATALIZ NA OSNOVE IMMOBILIZOVANNYKH KLETOK ILI FERMENTOV KAK ODIN IZ PODKHODOV K OCHISTKE VODY I ATMOSFERY V OBITAEMOM GERMOOB'EKTE]
T. E. LEBEDEVA, N. M. NAZAROV, and IU. E. SINIAK Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 42-45. In Russian. Dec. 1991 4 p In RUSSIAN refs
Copyright

The feasibility of using, in a regenerative life support system, immobilized cells to purify water and air in hermetically sealed habitats is discussed. Consideration is given to various methods for immobilizing bacteria that are selected for their adaptive abilities to assimilate organic components that need to be removed, and the suitable substances that can serve as the carriers for immobilized bacteria and enzymes. Particular attention is given to the use of denitrification bacteria immobilized on mineral carriers. The purification technique discussed here is of relevance to long-duration space missions, particularly for the flights to Mars. I.S.

A92-26019
A METHOD FOR A COMPREHENSIVE ASSESSMENT OF TECHNICAL EQUIPMENT FOR THE MEDICAL COMPARTMENT OF A SPACECRAFT [METODIKA KOMPLEKSNOI OTSENKI TEKHNICHESKOGO OSNASHCHENIIA KOSMICHESKOGO MEDITSINSKOGO BLOKA]
A. V. PERKOVSKII and B. A. ADAMOVICH Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 49-53. In Russian. Dec. 1991 5 p In RUSSIAN refs
Copyright

The paper describes the development of a model of a bacterial defense system (BDS) to be included in the medical compartment or medical section of a spacecraft. The BDS is designed to maintain, in the area designated for medical treatments, conditions of constant temperature, relative humidity, gas exchange, and desired ratios of atmospheric gases, as well as to keep low the levels of bacterial and particle contamination. Special attention is given to the method used for the assessment of the BDS, the set of factors to be assessed, and a model of a data base for computing the cost efficiency of the BDS. I.S.

A92-36535
THE DESIGN PRINCIPLES AND FUNCTIONING OF AN AUTOMATED INFORMATION SYSTEM FOR ESTIMATING THE PRESHIFT WORK CAPACITY OF OPERATORS [PRINTSIPY SOZDANIIA I FUNKTSIONIROVANIIA AVTOMATIZIROVANNOI INFORMATSIONNOI SISTEMY PREDSMENNOI OTSENKI RABOTOSPOSOBNOSTI OPERATOROV]
A. IU. BUROV (VNII Tekhnicheskoi Estetiki, Kiev, Ukraine) Kibernetika i Vychislitel'naia Tekhnika (ISSN 0454-9910), no. 90, 1991, p. 29-33. In Russian. 1991 5 p In RUSSIAN refs
Copyright

The parameters of operators' work capacity, obtained as a result of testing, are considered as output coordinates of a complex dynamic system, and the feasibility of using these indexes for estimating the system's organization and complexity is assessed. The obtained estimates are used to select the mathematical formula for describing man as a system, and, in particular, for selecting multiple regression models for predicting the work capacity of

workers at electric power plants. An automated information system called SPORO for estimating the preshift work capacity of these operators is described. I.S.

A92-55710
ECOLAB - BIOMODULE FOR EXPERIMENTAL LIFE-SUPPORT SYSTEMS INVESTIGATION UNDER MICROGRAVITY
I. I. GITEL'SON, S. I. BARTSEV, V. V. MEZHEVIKIN, and V. V. OKHONIN (Russian Academy of Sciences, Biophysics Institute, Krasnoyarsk, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 9 p. Aug. 1992 9 p refs
(IAF PAPER 92-0273) Copyright

Several versions of a biological life-support system (BLSS) designed by the Biophysics Institute (Krasnoyarsk, Russia) are evaluated, including BLSS based on microalgae, hydrogen-oxidizing bacteria, higher plants, and their combinations. The functioning of these systems and the weight and energetics considerations that would make these systems suitable for long-term space missions are discussed. Special attention is given to problems related to the need of alternating light and dark periods on LEOs. I.S.

N92-25840# Nauchno-Proizvodstvennoe Obedinenie Niichimmash, Moscow (USSR).
ENGINEERING PROBLEMS OF INTEGRATED REGENERATIVE LIFE-SUPPORT SYSTEMS
N. M. SAMSONOV (Kalinin (M. I.) Polytechnical Inst., Leningrad (USSR).), N. S. FARAFONOV (Kalinin (M. I.) Polytechnical Inst., Leningrad (USSR).), O. P. JAKIMENKO (Kalinin (M. I.) Polytechnical Inst., Leningrad (USSR).), E. I. GRIGOROV (Kalinin (M. I.) Polytechnical Inst., Leningrad (USSR).), V. N. KUBASOV (Kalinin (M. I.) Polytechnical Inst., Leningrad (USSR).), E. N. ZAITSEV (Kalinin (M. I.) Polytechnical Inst., Leningrad (USSR).), I. V. LAVROV (Kalinin (M. I.) Polytechnical Inst., Leningrad (USSR).), and B. A. ADAMOVICH (Institute of Biomedical Problems, Moscow, USSR) *In* ESA, 4th European Symposium on Space Environmental Control Systems, Volume 1 p 121-122 Dec. 1991
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

Some problems of the development and the principles of construction of a complex of regenerative life support systems for space stations are dealt with. A structural schematic and the funtions of a complex aboard the Soviet manned Space Station Mir are described. The possibility of water and oxygen artificial turnover being realized at zero gravity is shown and some related engineering problems are outlined. The use of simulated mathematical models and checking of serviceability of systems as components of Earth based medical/engineering complexes are considered. ESA

N92-25888# Nauchno-Proizvodstvennoe Obedinenie Niichimmash, Moscow (USSR).
CARBON DIOXIDE REDUCTION ABOARD THE SPACE STATION
L. I. GAVRILOV (Moscow Inst. of Graphic Arts (USSR).), V. A. NAUMOV (Moscow Inst. of Graphic Arts (USSR).), A. I. RJABKIN (Nauchno-Proizvodstvennoe Obedinenie Energija, Kaliningrad, USSR), T. N. PAVLOVA (Moscow Inst. of Graphic Arts (USSR).), N. M. SAMSONOV (Moscow Inst. of Graphic Arts (USSR).), and N. S. FARAFONOV *In* ESA, 4th European Symposium on Space Environmental Control Systems, Volume 1 p 473-475 Dec. 1991
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

Classification of carbon dioxide reduction processes to be used in CO2 processing systems is considered. The advantages and the problems of realization of the processes are considered. The results obtained in the development of a unit prototype based on the Sabatier process are discussed. ESA

N92-25889# Nauchno-Proizvodstvennoe Obedinenie Niichimmash, Moscow (USSR).
A SYSTEM FOR OXYGEN GENERATION FROM WATER ELECTROLYSIS ABOARD THE MANNED SPACE STATION MIR
J. E. BELAVENTSEV (Moscow Inst. of Graphic Arts (USSR).), L. I. GAVRILOV (Moscow Inst. of Graphic Arts (USSR).), A. S. GUZENBERG (Moscow Inst. of Graphic Arts (USSR).), N. S. GUSHIN (Moscow Inst. of Graphic Arts (USSR).), V. P. KOROLEV (Moscow Inst. of Graphic Arts (USSR).), A. G. PSHENICHNIKOV (Moscow Inst. of Graphic Arts (USSR).), A. M. RJABKIN (Academy of Sciences, USSR, Moscow), N. M. SAMSONOV (Moscow Inst. of Graphic Arts (USSR).), and N. S. FARAFONOV *In* ESA, 4th European Symposium on Space Environmental Control Systems, Volume 1 p 477-479 Dec. 1991
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

The problems arising from the development of systems for oxygen supply aboard the manned Mir Space Station are discussed. Electrolytic process realization, gas/electrolyte separation operational safety, and product oxygen quality are considered. The results of the Earth based system development and long term operation aboard the Space Station Mir are presented. The approaches to the improvement in the system design are contemplated. ESA

N92-25891# Nauchno-Proizvodstvennoe Obedinenie Niichimmash, Moscow (USSR).
AIR REGENERATION FROM MICROCONTAMINANTS ABOARD THE ORBITAL SPACE STATION
N. M. SAMSONOV (Moscow Inst. of Graphic Arts (USSR).), L. K. ABRAMOV (Moscow Inst. of Graphic Arts (USSR).), L. E. LITVINOV (Moscow Inst. of Graphic Arts (USSR).), V. I. MARGULIS (Moscow Inst. of Graphic Arts (USSR).), A. S. GUZENBERG (Moscow Inst. of Graphic Arts (USSR).), and A. M. RJABKIN (Nauchno-Proizvodstvennoe Obedinenie Energija, Kaliningrad, USSR) *In* ESA, 4th European Symposium on Space Environmental Control Systems, Volume 1 p 489-491 Dec. 1991
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

Major problems relating to the development of a system for atmospheric regeneration from harmful microcontaminants are dealt with: a classification of the composition of harmful contaminants, the formulation of the model composition of microcontaminants present in the atmosphere, the regeneration process flow diagram, the regeneration method, the accelerated lifetime test procedures. The results of Earth based complete tests of the system incorporated in the mockups of the module Kvant, the orbital Space Station Mir, a complex of the Space Station Mir/Kvant-2 as well as the development flight tests aboard an orbital complex of the Space Station Mir/Kvant/Kvant-2 are illustrated. The basic energy/mass characteristics of the system are described. ESA

N92-26951# Nauchno-Proizvodstvennoe Obedinenie Niichimmash, Moscow (USSR).
WATER RECOVERY FROM CONDENSATE OF CREW RESPIRATION PRODUCTS ABOARD THE SPACE STATION
N. M. SAMSONOV (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), N. S. FARAFONOV (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), V. M. NOVIKOV (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), L. S. BOBE (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), V. M. GORDEYEV (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), G. K. ABRAMOV (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), N. N. PROTASOV (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), J. E. SINJAK (European Space

Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), I. V. LAVROV (Nauchno-Proizvodstvennoe Obedinenie Energija, Kaliningrad, USSR), P. I. GLUSHENKO et al. *In* ESA, 4th European Symposium on Space Environmental Control Systems, Volume 2 p 625-627 Dec. 1991

Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

The process and equipment for water recovery from condensate derived from atmosphere thermal/moisture control facilities of the long endurance Mir manned Space Station are considered. The recovery process includes the reception and separation of liquid from the gas/liquid stream, water purification from contaminants, purified water saturation with food salts, and preservation to prevent the growth of microflora. Low energy processes and equipment for the system in zero gravity space flight are discussed. The recovery system is currently in operation aboard the orbital space station Mir. The energy requirements for recovered water (without water preheating on ingestion) and the specific weight of equipment are 4 W hr and 0.2 kg per kg of recovered water with about 100 percent of water recovery from condensate feed, and the quality conforming to the relevant standard. With the minor modification, the system may be used for future orbital space stations of new generation, Mars spaceships, and lunar bases. ESA

N92-26952# Nauchno-Proizvodstvennoe Obedinenie Niichimmash, Moscow (USSR).

WATER RECLAMATION FROM URINE ABOARD THE SPACE STATION

N. M. SAMSONOV (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), V. M. NOVIKOV (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), L. S. BOBE (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), B. J. PINSKI (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), V. A. LEONOV (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), N. N. PROTASOV (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), V. V. KOMOLOV (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).), V. B. FILONENKO (Nauchno-Proizvodstvennoe Obedinenie Vniigidromash, Moscow, USSR), and S. S. BOCHAROV *In* ESA, 4th European Symposium on Space Environmental Control Systems, Volume 2 p 629-631 Dec. 1991

Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

A system designed for water reclamation from urine by atmospheric distillation with condensate sorption post treatment is considered. A schematic process diagram and a system operation sequence are described. Some research and engineering problems relating to the development of equipment for the orbital Space Station are outlined. A process for water evaporation from solution into a vapor/gas fluid at the surface restricted by a capillary/porous hydrophilic selective membrane which ensures the process performance at zero gravity is analyzed. Some results of the operation of the system aboard the Soviet orbital Space Station Mir are discussed. The effectiveness and promise for water reclamation systems aboard the current and future Space Stations are shown. For long endurance orbital Space Stations, the most effective method is to reclaim water from urine. The reclaimed water is used as potable water and for food preparation (after additional conditioning) or for producing electrolyzed O2. The latter can fully provide the crew with simulated atmosphere for breathing. ESA

N92-26955# Nauchno-Proizvodstvennoe Obedinenie Niichimmash, Moscow (USSR).

HYGIENE WATER RECOVERY ABOARD THE SPACE STATION

N. M. SAMSONOV (Institute of Medical Radiology, Moscow (USSR).), N. S. FARAFONOV (Institute of Medical Radiology, Moscow (USSR).), L. K. ABRAMOV (Institute of Medical Radiology, Moscow (USSR).), S. S. BOCHAROV (Institute of Medical Radiology, Moscow (USSR).), N. N. PROTASOV (Institute of Medical Radiology, Moscow (USSR).), V. V. KOMOLOV (Institute of Medical Radiology, Moscow (USSR).), V. B. FILONENKO (Institute of Medical Radiology, Moscow (USSR).), and A. A. BERLIN (Institute of Biomedical Problems, Moscow, USSR) *In* ESA, 4th European Symposium on Space Environmental Control Systems, Volume 2 p 649-651 Dec. 1991

Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

The system for hygiene water recovery, which is currently in operation aboard the orbital Space Station Mir, is considered. The system receives untreated hygiene water as a water/air mixture from the handwash and shower facilities, separates the mixture phases, stores untreated water, purifies water from mechanical and dissolved impurities, decontaminates and stores purified water, and preheats and feeds purified water to the handwash and shower facilities. A schematic of the system is presented. The operations of the system, the method of water recovery, and design of main blocks are described. The ways of system updating are illustrated. The energy/mass characteristics of the system supporting the evidence of effectiveness of the system aboard the long term orbital space stations are listed. ESA

N92-26956# Kiev Polytechnic (USSR).

THE CENTRIFUGAL MASS EXCHANGE APPARATUS IN AIR-CONDITIONING SYSTEM OF ISOLATED, INHABITED OBJECT AND ITS WORK CONTROL

P. A. BARABASH (Kiev Polytechnic (USSR).), V. G. RIFERT (Kiev Polytechnic (USSR).), L. S. BOBE (Kiev Polytechnic (USSR).), N. N. GOLIYAD (Kiev Polytechnic (USSR).), and V. B. FILONENKO (Nauchno-Proizvodstvennoe Obedinenie Vniigidromash, Moscow, USSR) *In* ESA, 4th European Symposium on Space Environmental Control Systems, Volume 2 p 653-658 Dec. 1991

Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

The results of the research conducted in the hydrodynamic and heat and mass transfer processes taking place in separators-distillers are obtained, and recommendations for the design and manufacture of the equipment are given. A tradeoff analysis of several known methods of measuring the small concentrations of gas inclusions in liquids and aerosols is conducted, and, on the basis of this analysis, the integral method of light dispersion is chosen for implementation. ESA

N92-27009# Texas Southern Univ., Houston.

AN EVALUATIVE STUDY OF THE SENSORY QUALITIES OF SELECTED EUROPEAN AND ASIAN FOODS FOR INTERNATIONAL SPACE MISSIONS (A FRENCH FOOD STUDY)

S. AHMED and P. V. CORNISH *In* ESA, 4th European Symposium on Space Environmental Control Systems, Volume 2 p 1025-1030 Dec. 1991

Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC 150 Dutch guilders (2 vols)

European and Asian foods for international space missions were investigated by evaluating sensory qualities. Selected Russian, French, Japanese foods were prepared and evaluated by a taste panel for acceptability. Entrees, soups, desserts, vegetables, salads, beverages and snacks were evaluated on the basis of appearance, odor, favor and texture. Food samples were scored on a nine point hedonic scale. The result for the food samples comparatively studied showed significant differences between quality characteristics, foodtypes and compared groups (trained panelist and ethnic panelists) for the Russian and French food samples. The Japanese food samples indicated a significant difference between quality characteristics only at the 0.10 confidence level. Japanese foodtypes and compared groups were significantly different at the 0.05 confidence level. As a result of

this study, forty three Russian, thirty five French, and thirty seven Japanese foods were identified as possible candidates for international space missions. ESA

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MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

A92-20150
SOVIET CFD - AN INTERNATIONAL PERSPECTIVE
V. A. SOSUNOV and M. IA. IVANOV (Tsentral'nyi Nauchno-Issledovatel'skii Institut Aviatsionnogo Motorostroeniia, Moscow, USSR) Aerospace America (ISSN 0740-722X), vol. 30, Jan. 1992, p. 48-51. Jan. 1992 4 p
Copyright

An overview is presented of Soviet CFD development and the organizations that have had experience using moderately powerful computers to solve practical problems encountered in aerospace design methods. Highly accurate monotonic difference methods that follow the local flow structure, have been developed and now form the basis for constructing effective algorithms and codes that solve practical external and internal aerodynamics problems. Consideration is given to a potential area for international CFD cooperation that would involve solving problems connected with the design of scramjets for the aerospace plane. R.E.P.

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COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms, and specific applications, e.g., CAD/CAM.

A92-16832
THE DESIGNER-FEM MODEL INTERFACE BASED ON THE DATA BASE MANAGEMENT CONCEPT [INFORMATSIONNAIA SVIAZ' 'KONSTRUKTOR - MKE MODEL", OSNOVANNAIA NA KONTSEPTSII UPRAVLENIIA BAZAMI DANNYKH]
V. A. ZARUBIN Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 109-111. In Russian. 1990 3 p In RUSSIAN refs
Copyright

A conceptual architecture is considered which is intended for the storage and manipulation of data in RIPAK, a finite-element system for the design of aviation structures. The architecture proposed here enables the user to get answers to spontaneous, unplanned questions about the strength, stiffness, dynamic, and aeroelastic characteristics of the structure being designed by directly accessing the data base using the data manipulation language. The high flexibility and efficiency of such a system is demonstrated. Requirements for the practical implementation of the proposed architecture are defined. V.L.

A92-30385
A SOFTWARE PACKAGE FOR CALCULATING THE MOTION PARAMETERS OF SPACECRAFT IN A CENTRAL GRAVITATIONAL FIELD [PROGRAMMNYI KOMPLEKS DLIA RASCHETA PARAMETROV DVIZHENIIA KOSMICHESKOGO APPARATA V TSENTRAL'NOM GRAVITATSIONNOM POLE]
A. V. KRUTOV, A. V. FOMICHEV, and K. V. FIL'CHENKOV Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriia Priborostroenie (ISSN 0236-3933), Apr.-June 1991, p. 53-60. In Russian. Jun. 1991 8 p In RUSSIAN refs
Copyright

A software package has been developed for solving problems involving computation of trajectories, navigation, and guidance of spacecraft. General-purpose algorithms implemented in this software are described. The general structure of the software package and its principal modules are outlined. V.L.

A92-30386
DEVELOPMENT OF A METHOD FOR THE COMPUTER-AIDED DESIGN OF THERMOSTATIC CONTROL SYSTEMS [RAZRABOTKA METODA AVTOMATIZIROVANNOGO PROEKTIROVANIIA SISTEM TERMOSTATIROVANIIA]
A. A. POLIAKOV Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriia Priborostroenie (ISSN 0236-3933), Apr.-June 1991, p. 60-64. In Russian. Jun. 1991 5 p In RUSSIAN refs
Copyright

An approach to the computer-aided design of thermostatic control systems is presented which uses a generalized mathematical model as the basis for software organization and system optimization. The components of a thermostatic control system, their coupling, and the associated thermophysical processes are described by using a system of equations. The system of equations representing the generalized mathematical model is solved by introducing closed-loop and open-loop coupling structures in the form of an oriented graph. V.L.

A92-30389
AN APPLICATION SOFTWARE PACKAGE FOR THE AUTOMATION OF THE DESIGN OF MULTIPLE-PLANT MULTICRITERIAL CONTROL SYSTEMS [PAKET PRIKLADNYKH PROGRAMM DLIA AVTOMATIZATSII PROEKTIROVANIIA MNOGOOB'EKTNYKH MNOGOKRITERIAL'NYKH SISTEM UPRAVLENIIA]
E. M. VORONOV, V. A. SEROV, A. E. STEPANISHCHEV, and S. A. SINITSYN Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriia Priborostroenie (ISSN 0236-3933), Apr.-June 1991, p. 118-123. In Russian. Jun. 1991 6 p In RUSSIAN
Copyright

An application software package is described which has been designed for solving problems arising in the design of complex control systems and for selecting the parameters of complex dynamic systems on the basis of the vector index. The software has been implemented in FORTRAN and PASCAL. The principal software modules are briefly described. V.L.

A92-35506
DEMOS - STATE-OF-THE-ART APPLICATION SOFTWARE FOR DESIGN, EVALUATION, AND MODELING OF OPTICAL SYSTEMS
MIKHAIL A. GAN, DMITRII D. ZHDANOV, VADIM V. NOVOSEL'SKII, SERGEI I. USTINOV, ALEKSANDR O. FEDOROV, and IGOR' S. POTEMIN (State Optical Institute, St. Petersburg, Russia) Optical Engineering (ISSN 0091-3286), vol. 31, no. 4, April 1991, p. 696-700. Apr. 1991 5 p
Copyright

A new version of the DEMOS program is presented. DEMOS (design, evaluation, and modeling of optical systems) is integrated dialog software for automatic modeling to estimate and design optical systems with conventional and hologram optical elements. The theoretical principles and the current state of the primary possibilities and application principles of the DEMOS program for optical systems design and simulation on computers are discussed. Author

A92-42780
AUTOMATION OF FLIGHT VEHICLE DESIGN [AVTOMATIZATSIIA PROEKTIROVANIIA LETATEL'NYKH APPARATOV]
VIACHESLAV V. VOLODIN Moscow, Izdatel'stvo Mashinostroenie, 1991, 256 p. In Russian. 1991 256 p In RUSSIAN refs
(ISBN 5-217-01447-4) Copyright

The theoretical principles of the development of CAD systems

for the design of flight vehicles are presented. Attention is given to methods for providing various types of support for CAD systems, including the types of support that have been largely neglected in the literature (e.g., linguistic, organizational, and methodological). Topics discussed include a systems approach to design automation, methodology of the general development of CAD systems, and methodological aspects of the detailed design of CAD. V.L.

A92-57253
PROSPECTS OF AEROSPACE SYSTEM APPLICATIONS IN SPACE MISSIONS
IGOR' I. KURKIN and DMITRII A. SIDOROV (Moscow Aviation Institute, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 9 p. Aug. 1992 9 p refs (IAF PAPER 92-0861) Copyright

A system of computer programs which has been developed to conduct a complex design analysis of aerospace systems and determine their optimum areas of application is described. Typical configurations of aerospace systems, including a variation of aerospace plane launching from a thermoplane-type platform, are analyzed. A method of estimating the specific cost of an aerospace system based on simulation is proposed. P.D.

N92-26835# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Ehnergij.
ON INCREASING THE CAPABILITIES OF THE SMART ADAPTIVE RANDOM NUMBER GENERATOR
V. A. ANIKEEVA and G. G. TAKHTAMYSHEV 1991 6 p In RUSSIAN; ENGLISH summary
(DE92-621106; IFVE-OMVT-91-12) Avail: CASI HC A02/MF A01

The algorithm is proposed to achieve accelerated convergence when calculating multiple integrals by the Monte Carlo method for the case of strong correlation. The algorithm is based on nonlinear coordinate system transformation similar to the rotation but the domain is left to be unitary hypercube. The examples show that the number of points to achieve the given precision becomes smaller by the factor of ten. DOE

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COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

A92-25272
DEVELOPMENT OF NEW TECHNOLOGY FOR CONDUCTING COMPUTER-CONTROLLED COMPLEX MEDICAL INVESTIGATIONS ABOARD MIR WITHIN THE FRAMEWORK OF THE SHIPKA PROJECT [SOZDANIE NOVOI TEKHNOLOGII PROVEDENIIA I REALIZATSII UPRAVLIAEMYKH AVTONOMNYKH KOMPLEKSNYKH MEDITSINSKIKH ISSLEDOVANII NA BORTU STANTSII 'MIR' PO PROEKTU 'SHIPKA']
R. D. NEDKOV, V. M. SHALAMANOV, S. D. SIMEONOV, S. K. TANEV, V. I. KOZHARINOV, and V. V. BOGOMOLOV Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 56-58. In Russian. Oct. 1991 3 p In RUSSIAN refs
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The technology of conducting computer-controlled neurophysiological and psychophysiological studies during the Soviet-Bulgarian Shipka project aboard Mir is discussed. The Shipka project includes the following experiments: (1) the Labirint experiment, for studying mechanisms of the development of deficiencies in the relationship between the vestibulatory and the visual systems due to space flight; (2) the Statokinetica experiment, for studying the mechanism of the body-position regulation; (3) the Potential experiment, for studying the condition of excitable muscle-fiber membranes; and (4) a study of the characteristics of psychological adaptation in individual cosmonauts by means of a questionnaire, and of the effects of relaxation and entertainment on the psychological adaptation. Block diagrams of the experimental software support are presented. I.S.

63

CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems.

A92-12151
ADAPTIVE ALGORITHMS FOR THE STABILIZATION OF THE STEADY STATES AND PROGRAMMED TRAJECTORIES OF THE MOTION OF MULTIDIMENSIONAL SYSTEMS [ADAPTIVNYE ALGORITMY STABILIZATSII STATSIONARNYKH SOSTOIANII I PROGRAMMNYKH TRAEKTORII DVIZHENIIA MNOGOMERNYKH SISTEM]
P. D. KRUT'KO (Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 319, no. 2, 1991, p. 296-299. In Russian. 1991 4 p In RUSSIAN refs
Copyright

A theory is developed that is directly applicable to those cases when the dynamics of the actuator elements is described by equations higher than first order. In these situations it is necessary to appropriately increase the order of the differential control laws. L.M.

A92-12158
OPTIMIZATION OF STOCHASTIC SYSTEMS OF THE DIFFUSION TYPE WITH CONSTRAINTS ON THE CONTROL-OBSERVATION PROCESS. I - SUFFICIENT OPTIMALITY CONDITIONS [OPTIMIZATSIIA STOKHASTICHESKIKH SISTEM DIFFUZIONNOGO TIPA S OGRANICHENIIAMI NA PROTSESS UPRAVLENIIA-NABLIUDENIIA. I - DOSTATOCHNYE USLOVIIA OPTIMAL'NOSTI]
S. V. SAVASTIUK and M. M. KHRUSTALEV (Moskovskii Aviatsionnyi Institut, Moscow, USSR) Avtomatika i Telemekhanika (ISSN 0005-2310), July 1991, p. 89-96. In Russian. Jul. 1991 8 p In RUSSIAN refs
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New optimality conditions are obtained in the control problem for a partially observable diffusion process. A new class of optimization problems for diffusion-type stochastic systems with constraints on the control process is considered in which each control strategy component may be dependent on an arbitrarily assigned set of state vector components. For this new class of problems, conditions of global optimality are proposed, and dynamic programming relations are derived. The applicability of the theory proposed here to the decentralized control program is demonstrated. V.L.

A92-12159
OPTIMIZATION OF CORRECTION DEVICES IN THE SELF-TUNING LOOPS OF MULTIDIMENSIONAL ADAPTIVE SYSTEMS WITH A MODEL BASED ON THEIR LINEARIZED EQUIVALENTS [OPTIMIZATSIIA KORREKTIRUIUSHCHIKH USTROISTV V KONTURAKH SAMONASTROIKI MNOGOMERNYKH ADAPTIVNYKH SISTEM S MODEL'IU NA OSNOVE IKH LINEARIZOVANNYKH EKVIVALENTOV]
B. G. IL'IASOV, IU. S. KABAL'NOV, R. A. MUNASYPOV (Ufimskii Aviatsionnyi Institut, Ufa, USSR), and V. IU. RUTKOVSKII (Institut Problem Upravleniia, Moscow, USSR) Avtomatika i Telemekhanika (ISSN 0005-2310), July 1991, p. 97-109. In Russian. Jul. 1991 13 p In RUSSIAN refs
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A92-12751
AN ALGORITHM FOR THE COMPUTER-AIDED SYNTHESIS OF AUTOMATIC CONTROL SYSTEMS WITH A NONSTRICTLY SPECIFIED PLANT [ALGORITM AVTOMATIZIROVANNOGO SINTEZA SISTEM AVTOMATICHESKOGO UPRAVLENIIA S NEZHESTKO ZADANNYM OB'EKTOM]
A. S. BURGONSKII, N. B. TALAIKOVA, and V. I. TUMARKIN (Leningradskii Institut Tochnoi Mekhaniki i Optiki, Leningrad, USSR) Priborostroenie (ISSN 0021-3454), vol. 34, no. 4, 1991, p. 14-19. In Russian. 1991 6 p In RUSSIAN refs
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An iteration procedure is presented for the flexible computer-aided synthesis of the optimal dynamic characteristics of an automatic control system with a nonstrictly specified plant. The principal stages of the procedure are identified, and methods for reducing the number of iterations are proposed. A flow chart of the algorithm is included. V.L.

A92-12752
OPTIMAL STABILIZATION OF A LINEAR DYNAMIC PLANT [OPTIMAL'NAIA STABILIZATSIIA LINEINOGO DINAMICHESKOGO OB'EKTA]
V. N. KOZLOV and V. M. FILIPOVSKII (Leningradskii Politekhnicheskii Institut, Leningrad, USSR) Priborostroenie (ISSN 0021-3454), vol. 34, no. 4, 1991, p. 19-24. In Russian. 1991 6 p In RUSSIAN refs
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A control synthesis procedure is proposed which complements the known methods of solving inverse problems in dynamics and employs a functional dynamic programming algorithm. Systems functioning in continuous and discrete time are examined. It is shown that the problem of the synthesis of optimal control of the motion of a linear plant from a linear manifold can be reduced to that of solving a generalized Riccati equation. V.L.

A92-12795
APPROXIMATION OF PREFERENCE RELATIONS ON A SET OF DYNAMIC SYSTEMS [OB APPROKSIMATSII OTNOSHENII PREDPOCHTENIIA NA MNOZHESTVE DINAMICHESKIKH SISTEM]
P. S. KRASNOSHCHEKOV, A. G. PEREVOZCHIKOV, and V. V. FEDOROV (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 319, no. 5, 1991, p. 1091-1094. In Russian. 1991 4 p In RUSSIAN refs
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Multicriterial models of the parametric synthesis of dynamic systems with vector criteria are considered. General constructions of approximating relations are proposed which can be used for a preliminary sifting of unpromising variants. Minimax problems of system synthesis according to auxiliary approximating relations are stated. L.M.

A92-16701
SOME METHODS FOR THE NUMERICAL SOLUTION OF CONTINUOUS CONVEX STOCHASTIC PROBLEMS OF OPTIMAL CONTROL [NEKOTORYE METODY CHISLENNOGO RESHENIIA NEPRERYVNYKH VYPUKLYKH STOKHASTICHESKIKH ZADACH OPTIMAL'NOGO UPRAVLENIIA]
N. M. NOVIKOVA Zhurnal Vychislitel'noi Matematiki i Matematicheskoi Fiziki (ISSN 0044-4669), vol. 31, Nov. 1991, p. 1605-1618. In Russian. Nov. 1991 14 p In RUSSIAN refs
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Stochastic iterative algorithms are proposed which make it possible to search for a priori optimal control in the presence of random perturbations in the functional and equations of motion. Attention is also given to time-dependent perturbations, perturbations with an unknown distribution law, and perturbations partially observed in the control process. Some characteristic properties of the algorithms are discussed. V.L.

A92-16715
ALGEBRAIC APPROACH TO THE ANALYSIS AND SYNTHESIS OF DISTRIBUTED CONTROLLED SYSTEMS [ALGEBRAICHESKII PODKHOD K ANALIZY I SINTEZY RASPREDELENNYKH UPRAVLIAEMYKH SISTEM]
S. M. GERASIMOV and V. A. PODCHUKAEV (Saratovskii Politekhnicheskii Institut, Saratov, USSR) Avtomatika i Telemekhanika (ISSN 0005-2310), May 1991, p. 57-62. In Russian. May 1991 6 p In RUSSIAN refs
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An algebraic approach to the analysis and synthesis of distributed controlled systems is developed on the basis of space state methods that are commonly applied to finite-dimensional systems. An attempt is made to find some common features relating both classes of systems with a view to developing a unified analytical theory for automatic control systems irrespective of whether they are finite-dimensional or distributed. The discussion covers stability analysis, a compensation method used in distributed system stabilization, and synthesis of a controller for a heating element. V.L.

A92-16716
INDUCED PERIODIC REGIMES IN CONTROL SYSTEMS WITH DERIVATIVE CONTROL [VYNUZHDENNYE PERIODICHESKIE REZHIMY V SISTEMAKH REGULIROVANIIA S UPRAVLENIEM PO PROIZVODNOI]
N. D. POKROVSKAIA (Institut Problem Upravleniia, Moscow, USSR) Avtomatika i Telemekhanika (ISSN 0005-2310), May 1991, p. 62-67. In Russian. May 1991 6 p In RUSSIAN refs
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The paper is concerned with the problem of the existence of 2 pi-periodic regimes in derivative control systems and with the analysis of these regimes. A new approach to the analysis of induced oscillations in this class of systems is proposed. Frequency criteria are obtained for the solvability of this problem. V.L.

A92-16718
ADAPTIVELY INVARIANT DISCRETE CONTROL SYSTEMS [ADAPTIVNO INVARIANTNYE DISKRETNYE SISTEMY UPRAVLENIIA]
IA. Z. TSYPKIN (Institut Problem Upravleniia, Moscow, USSR) Avtomatika i Telemekhanika (ISSN 0005-2310), May 1991, p. 96-124. In Russian. May 1991 29 p In RUSSIAN refs
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Discrete control systems are considered which are exposed to incompletely determined external perturbations. Structures of selectively and adaptively invariant control systems are defined in which the effect of external deterministic perturbations is eliminated and the effect of stochastic perturbations is significantly alleviated. Examples illustrating the efficiency of selectively and adaptively invariant systems are presented. Some properties and capabilities of such systems are discussed. V.L.

A92-16720
ROBUST STABILITY IN THE CASE OF COMPLEX PARAMETER PERTURBATIONS [ROBASTNAIA USTOICHIVOST' PRI KOMPLEKSNYKH VOZMUSHCHENIIAKH PARAMETROV]
B. T. POLIAK and IA. Z. TSYPKIN (Institut Problem Upravleniia, Moscow, USSR) Avtomatika i Telemekhanika (ISSN 0005-2310), Aug. 1991, p. 45-55. In Russian. Aug. 1991 11 p In RUSSIAN refs
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The paper is concerned with the stability of an incompletely determined system corresponding to a family of characteristic equations with coefficients varying in a circle on a complex plane. The necessary and sufficient conditions for the robust stabilty of continuous and discrete linear systems are presented. A stability analysis is also carried out for closed-loop systems (with a fixed controller and an indeterminate plant). Conditions are determined for the absolute robust stability of nonlinear systems. V.L.

A92-16721
OPTIMIZATION OF DIFFUSION-TYPE STOCHASTIC SYSTEMS WITH CONSTRAINTS ON THE CONTROL-OBSERVATION PROCESS. II - NECESSARY OPTIMALITY CONDITIONS [OPTIMIZATSIIA STOKHASTICHESKIKH SISTEM DIFFUZIONNOGO TIPA S OGRANICHENIIAMI NA PROTSESS UPRAVLENIIA-NABLIUDENIIA. II - NEOBKHODIMYE USLOVIIA OPTIMAL'NOSTI]
S. V. SAVASTIUK and M. M. KHRUSTALEV (Moskovskii Aviatsionnyi Institut, Moscow, USSR) Avtomatika i Telemekhanika (ISSN 0005-2310), Aug. 1991, p. 94-101. In Russian. Aug. 1991 8 p In RUSSIAN refs
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An analysis is made of the optimal control problem for a partially observable diffusion process (the Fleming problem), a particular case of the optimal control problem for a stochastic system with constraints on the control/observation process. Novel optimality conditions, including the necessary conditions, are proposed, which differ from the known optimality conditions. The optimization of a linear system with a quadratic functional is considered as an example. V.L.

A92-16722
MAXIMUM LIKELIHOOD ESTIMATION OF THE STATE OF AN OPTIMALLY CONTROLLED SYSTEM [MAKSIMAL'NO PRAVDOPODOBNAIA OTSENKA SOSTOIANIIA OPTIMAL'NO UPRAVLIAEMOI SISTEMY]
V. N. TARAN (Rostovskoe VVKIU RV, Rostov-on-Don, USSR) Avtomatika i Telemekhanika (ISSN 0005-2310), Aug. 1991, p. 101-108. In Russian. Aug. 1991 8 p In RUSSIAN refs
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The problem of optimal control observation is analyzed in the case where the control forces are not directly observable. The information on the plant state is supplied to the observer as a signal transmitted over a noisy channel. The problem of the maximum likelihood estimation of the state of a system subject to optimal control in accordance with a specified criterion is solved analytically, and the equations obtained are compared with the existing equations. The analysis presented here is particularly relevant to spacecraft tracking problems. V.L.

A92-16810
STABILIZATION OF DYNAMIC PLANTS WITH UNKNOWN NONSTATIONARY PARAMETERS BY MEANS OF LINEAR AND ADAPTIVE CONTROLS [STABILIZATSIIA DINAMICHESKIKH OB'EKTOV S NEIZVESTNYMI NESTATSIONARNYMI PARAMETRAMI LINEINYMI I ADAPTIVNYMI UPRAVLENIIAMI]
B. V. ULANOV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 38-40. In Russian. 1990 3 p In RUSSIAN refs
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The paper is concerned with the stabilization problem for a dynamic plant with unknown parameters that vary in an arbitrary manner within any finite limits. A method for the synthesis of liner stabilizing control is proposed. The possibility of solving the problem in a class of adaptive controls is demonstrated. V.L.

A92-18303
OPTIMAL DISCRETE CONTROL SYSTEMS FOR NONMINIMUM-PHASE PLANTS [OPTIMAL'NYE DISKRETNYE SISTEMY UPRAVLENIIA NEMINIMAL'NO-FAZOVYMI OB'EKTAMI]
IA. Z. TSYPKIN (AN SSSR, Institut Problem Upravleniia, Moscow, USSR) Avtomatika i Telemekhanika (ISSN 0005-2310), Nov. 1991, p. 96-118. In Russian. Nov. 1991 23 p In RUSSIAN refs
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Methods for the synthesis of an optimal discrete control system for a nonminimum-phase plant are discussed which are based on the minimization of a criterion in the form of the difference norm of the transfer functions of the reference model and synthesized system. The selection of this norm determines the structure and parameters of the optimal controller and the properties of the synthesized system. A synthesis procedure is proposed which leads to a zero difference norm of the transfer functions, making it possible to avoid the constraints imposed by the nonminimum-phase nature of the plant. V.L.

A92-18315
CONTROLLED SYSTEM OPTIMIZATION WITH RESPECT TO LOCAL FUNCTIONALS CHARACTERIZING THE ENERGY OF MOTION [OPTIMIZATSIIA UPRAVLIAEMYKH SISTEM PO LOKAL'NYM FUNKTSIONALAM, KHARAKTERIZUIUSHCHIM ENERGIIU DVIZHENIIA]
P. D. KRUT'KO (Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 320, no. 3, 1991, p. 581-585. In Russian. 1991 5 p In RUSSIAN refs
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The idea of motion control based on accelerations, proposed by Pospelov (1964), is further developed and applied to motion control problems for high-order systems. This approach leads to a new theory of dynamic system synthesis based on the minimization of local functionals representing the energy of the higher derivatives of the controlled coordinates. The structure and parameters of the control algorithm are unambiguously determined by the structure and parameters of the reference model used to define the requirements for the dynamics of the system being designed. V.L.

A92-18325
SMALL EXPERTS AND INTERNAL CONFLICTS IN LEARNING NEURAL NETWORKS [MALYE EKSPERTY I VNUTRENNIE KONFLIKTY V OBUCHAEMYKH NEIRONNYKH SETIAKH]
S. E. GILEV, A. N. GORBAN', and E. M. MIRKES (AN SSSR, Vychislitel'nyi Tsentr; AN SSSR, Institut Biofiziki, Krasnoyarsk, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 320, no. 1, 1991, p. 220-223. In Russian. 1991 4 p In RUSSIAN refs
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Hierarchical neural networks consisting of small network-experts are considered. The main designs are discussed, with attention given to the adaptive signal-reception matrix, and sequential and parallel learning. An example of implementation is presented. L.M.

A92-21626
CONTROL SYNTHESIS FOR A SYSTEM WITH NONLINEAR RESISTANCE [SINTEZ UPRAVLENIIA SISTEMOI S NELINEINYM SOPROTIVLENIEM]
F. L. CHERNOUS'KO Prikladnaia Matematika i Mekhanika (ISSN 0032-8235), vol. 55, Nov.-Dec. 1991, p. 883-894. In Russian. Dec. 1991 12 p In RUSSIAN refs
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A dynamic one-degree-of-freedom plant is considered which is subjected to a nonlinear resistance force and control and perturbation forces. A feedback-type control is synthesized which brings the system to a specified state. The advantages of the approach over an approach that ignores perturbations are demonstrated. The control is obtained for an arbitrary type of nonlinear resistance; it is suboptimal with respect to speed of response and has low sensitivity to parameter variations and perturbations. V.L.

A92-23482
SYNTHESIS OF FEEDBACK-TYPE CONTROLS IN A LINEAR PROBLEM [POSTROENIE OPTIMAL'NYKH UPRAVLENII TIPA OBRATNOI SVIAZI V LINEINOI ZADACHE]
R. GABASOV, F. M. KIRILLOVA, and O. I. KOSTIUKOVA (Belorusskii Gosudarstvennyi Universitet; AN Respubliki Belarus', Institut Matematiki, Minsk, Belarus) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 320, no. 6, 1991, p. 1294-1299. In Russian. 1991 6 p In RUSSIAN refs
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A new approach to the problem of optimal feedback control synthesis is proposed. The approach is based on a dynamic formulation and special constructs representing an extension of

numerical methods of optimal control synthesis. An algorithm is presented for the operation of controllers capable of generating, in real time, controls circulating in optimal closed-loop systems. V.L.

A92-25967
STRUCTURAL PROPERTIES OF OPTIMAL LIMIT SYSTEMS [STRUKTURNYE SVOISTVA PREDEL'NYKH OPTIMAL'NYKH SISTEM]
I. M. BAKHILINA and D. M. LERNER (Leningradskii Elektrotekhnicheskii Institut, Leningrad, USSR) Avtomatika i Telemekhanika (ISSN 0005-2310), Dec. 1991, p. 52-61. In Russian. Dec. 1991 10 p In RUSSIAN refs
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Linear systems are examined which are optimal with respect to a quadratic quality criterion. A class of controllers is identified in which some of the coefficients remain limited in modulus. The final limiting values of these coefficients are shown to compensate for some cross constraints in a closed system, forming a subsystem containing output coordinates and isolated from the effects of the rest of the system. Optimal limit and invariant systems are compared. V.L.

A92-25968
SOLUTION ESTIMATION FOR A NEARLY OPTIMAL LINEAR FILTER [OB OTSENKE RESHENIIA POCHTI OPTIMAL'NOGO LINEINOGO FIL'TRA]
E. A. SEMENCHIN (Stavropol'skii Politekhnicheskii Institut, Stavropol, USSR) Avtomatika i Telemekhanika (ISSN 0005-2310), Dec. 1991, p. 84-91. In Russian. Dec. 1991 8 p In RUSSIAN refs
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An expression is presented which provides an upper bound for the mathematical expectation of the squared deviation of a nearly optimal estimate from the optimal one in the problem of linear filtering of a partially observed stochastic process of the diffusion type. The expression leads to the known result concerning the convergence, in a root mean square solution, of a nearly optimal filter to the optimal estimate in the case of a degenerate noise covariance matrix of the observed process components. V.L.

A92-25969
SYNTHESIS OF A DISCRETE SYSTEMS OPTIMIZED FOR SPEED OF RESPONSE [SINTEZ OPTIMAL'NOI PO BYSTRODEISTVIIU DISKRETNOI SISTEMY]
R. GABASOV (Belorusskii Gosudarstvennyi Universitet, Minsk, Belarus), F. M. KIRILLOVA, and S. V. PRISHCHEPOVA (Belorusskaia AN, Institut Matematiki, Minsk, Belarus) Avtomatika i Telemekhanika (ISSN 0005-2310), Dec. 1991, p. 92-99. In Russian. Dec. 1991 8 p In RUSSIAN refs
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The problem of control optimization with respect to speed of response is formulated, and a discrete controller algorithm is proposed which provides for time-optimized transient processes in linear systems. The efficiency of the optimal controller is illustrated by an example. V.L.

A92-25970
INCREASING THE CONVERGENCE RATE OF THE LEARNING PROCESS IN A SPECIALIZED ASSOCIATIVE MEMORY SYSTEM [POVYSHENIE SKOROSTI SKHODIMOSTI PROTSESSA OBUCHENIIA V SPETSIAL'NOI SISTEME ASSOTSIATIVNOI PAMIATI]
E. D. AVED'IAN (AN SSSR, Institut Problem Upravleniia, Moscow, USSR) and M. HORMEL (Darmstadt, Technische Hochschule, Federal Republic of Germany) Avtomatika i Telemekhanika (ISSN 0005-2310), Dec. 1991, p. 100-109. In Russian. Dec. 1991 10 p In RUSSIAN refs
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A new learning algorithm is proposed for a specialized associative memory system design for the control of nonlinear dynamic plants. The convergence rate of the algorithm is shown to be higher than that of other known learning algorithms. Results of numerical experiments are presented to support the conclusions concerning the convergence rate of the algorithm and to illustrate some of the characteristic features of the algorithm. V.L.

A92-27525
SOLUTION OF PROBLEMS OF THE OPTIMAL ESTIMATION OF THE STATE OF A PERTURBED LINEAR FILTER [O RESHENII ZADACHI OPTIMAL'NOI OTSENKI SOSTOIANIIA VOZMUSHCHENNOGO LINEINOGO FIL'TRA]
S. V. SOKOLOV Avtometriia (ISSN 0320-7102), Nov.-Dec. 1991, p. 52-64. In Russian. Dec. 1991 13 p In RUSSIAN refs
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The problem considered here is formulated as the problem of the optimal estimation of the error vector of a perturbed Kalman filter. The use of the formalism for the analysis of the perturbations of multidimensional linear systems has made it possible to obtain an equation for the error vector of the perturbed a posteriori dispersion in addition to the equation for the error vector of the perturbed estimation. The optimal estimation of such an expanded vector is obtained by using methods of conditional Gaussian filtering. The practical application of the results is illustrated by an example. V.L.

A92-30130
INVESTIGATION OF EXTREMAL FIELD BEHAVIOR FOR TWO-DIMENSIONAL LINEAR PROBLEMS IN FLIGHT MECHANICS [ISSLEDOVANIE ZAKONOMERNOSTEI POLIA EKSTREMALEI DVUMERNYKH LINEINYKH ZADACH MEKHANIKI POLETA]
L. P. FEDOROV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 1, 1990, p. 36-48. In Russian. 1990 13 p In RUSSIAN refs
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The characteristics of the extremal field for the simplest class of variational problems in flight mechanics, where the problems contain two differential bounds with a control variable entering linearly into them, are investigated using methods developed by Illarionov and Pashintsev (1971, 1973, 1974). The well-known solution methods including the Miele method, the Ostoslavskii-Lebedev method, and the Pontriagin maximum principle are compared. Particular attention is given to special control portions of the extremals. I.S.

A92-30164
CALCULATION OF THE BOUNDARY OF THE ASYMPTOTIC STABILITY REGION IN A DYNAMIC SYSTEM [RASCHET GRANITSY OBLASTI ASIMPTOTICHESKOI USTOICHIVOSTI DINAMICHESKOI SISTEMY]
M. G. GOMAN and A. V. KHRAMTSOVSKII TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 3, 1990, p. 79-87. In Russian. 1990 9 p In RUSSIAN refs
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An algorithm is presented for calculating 2D boundary cross sections of the asymptotic stablity region for a steady-state solution of a multidimensional dynamic system, with special attention given to the case where the boundary is formed by a separatrix surface that traverses a steady-state saddle solution. The algorithm includes a solution of the boundary value problem by means of integrating the dynamic equations and the use of a continuation method. As an example, the algorithm is applied in a problem of the lateral motion of a spacecraft, which is described by third-order nonlinear equations. I.S.

A92-30169
MEAN-SQUARE APPROXIMATION BY EVEN NONNEGATIVE FRACTIONAL-RATIONAL FUNCTIONS [SREDNEKVADRATICHNAIA APPROKSIMATSIIA CHETNYMI NEOTRITSATEL'NYMI DROBNO-RATSIONAL'NYMI FUNKTSIIAMI]
S. N. SUPRUNENKO TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 3, 1990, p. 114-127. In Russian. 1990 14 p In

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The paper considers the problem of mean-square approximation by fractional-rational functions in which the numerator and the denominator are both even nonnegative real polynomials. Such problems usually occur during the development of models of spectral densities of random processes and amplitude-frequency characteristics of dynamic systems. A method is proposed to solve such problems by reducing them to the determination of the minimal-phase spectral factor of the approximating function. I.S.

A92-30309
ADAPTIVE CONTROL OF THE THREE-DIMENSIONAL MOTION OF NONLINEAR PLANTS [ADAPTIVNOE UPRAVLENIE PROSTRANSTVENNYM DVIZHENIEM NELINEINYKH OB'EKTOV]
I. V. MIROSHNIK and V. O. NIKIFOROV (Leningradskii Institut Tochnoi Mekhaniki i Optiki, Leningrad, USSR) Avtomatika i Telemekhanika (ISSN 0005-2310), Sept. 1991, p. 78-87. In Russian. Sep. 1991 10 p In RUSSIAN refs
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The paper is concerned with the problem of the three-dimensional motion of a parametrically perturbaed nonlinear plant. A method for the synthesis of an adaptive system and a combined control algorithm are proposed. In accordance with the approach used here, data on the parametric perturbations, required for the adaptive control, are based on deviations from a specified manifold. V.L.

A92-30310
SUFFICIENT OPTIMALITY CONDITIONS IN MINIMAX CONTROL PROBLEMS [O DOSTATOCHNYKH USLOVIIAKH OPTIMAL'NOSTI V MINIMAKSNYKH ZADACHAKH UPRAVLENIIA]
A. F. TARAKANOV (Balashovskii Gosudarstvennyi Pedagogicheskii Institut, Balashov, Russia) Avtomatika i Telemekhanika (ISSN 0005-2310), Sept. 1991, p. 87-95. In Russian. Sep. 1991 9 p In RUSSIAN refs
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The method of penalty functions and dynamic programming concepts are used to reduce a minimax control problem with terminal constraints to a variational problem. A local sufficient optimality condition, supplementing the necessary conditions, is obtained under certain assumptions. The control synthesis procedure is illustrated by an example. V.L.

A92-30311
ROBUSTNESS OF CONTROL SYSTEMS WITH NONLINEAR PARAMETRIC CORRECTION FOR CERTAIN TYPES OF PERTURBATIONS [ROBASTNOST' SISTEM UPRAVLENIIA S NELINEINOI PARAMETRICHESKOI KORREKTSIEI K NEKOTORYM VIDAM VOZMUSHCHENII]
I. N. KRUTOVA and V. IU. RUTKOVSKII (Institut Problem Upravleniia, Moscow, Russia) Avtomatika i Telemekhanika (ISSN 0005-2310), Sept. 1991, p. 145-159. In Russian. Sep. 1991 15 p In RUSSIAN refs
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An analysis is made of the robustness of a control system with nonlinear parametric correction (based on an adaptive system structure with a reference model) for inaccuracy of the mathematical description of the system dynamics and parametric and coordinate perturbations. The efficiency of the correction proposed here is demonstrated using a system for the control of the pitching motion of a flight vehicle as an example. V.L.

A92-30387
SYNTHESIS OF EFFICIENT CONTROL SYSTEMS. I - THE OPTIMAL-EFFICIENCY CONTROL PROBLEM AND A CONTROL SYNTHESIS METHOD [SINTEZ EFFEKTIVNYKH SISTEM UPRAVLENIIA. I - ZADACHA OPTIMAL'NOGO PO EFFEKTIVNOSTI UPRAVLENIIA I METODIKA EE FORMIROVANIIA]
V. P. KOLESNIK Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriia Priborostroenie (ISSN 0236-3933), Apr.-June 1991, p. 100-112. In Russian. Jun. 1991 13 p In RUSSIAN refs
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A new class of problems in control theory is formulated which deals with the synthesis of a maximum-efficiency system as the result of the combined synthesis of the control law and certain plant parameters. An efficiency criterion is proposed in the form of a fractional-rational convolution of contradictory requirements for the system including both management categories and technico-economical factors. The relationship between the efficiency maximization problem and traditional problems in optimal control theory is examined. V.L.

A92-31966
AUTONOMOUS INVARIANT CONTROL OF THE OUTPUT OF DYNAMIC SYSTEMS WITH NONLINEAR INTERACTIONS [AVTONOMNOE INVARIANTNOE UPRAVLENIE VYKHODOM DINAMICHESKIKH SISTEM S NELINEINYMI VZAIMODEISTVIIAMI]
IU. B. SHTESSEL' and A. IU. EVNIN (Cheliabinskii Politekhnicheskii Institut, Chelyabinsk, Russia) Priborostroenie (ISSN 0021-3454), vol. 34, no. 5, 1991, p. 15-21. In Russian. 1991 7 p In RUSSIAN refs
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The paper is concerned with control systems that are described by vector differential equations with nonlinear terms reflecting the interaction between subsystems. The problem of synthesis of discontinuous centralized control is formulated and solved. The problem of the triaxial stabilization of a platform in a three-degree-of-freedom gimbal suspension is considered as an example. V.L.

A92-31967
ADAPTIVE CONTROL OF PROGRAMMED MOTION [ADAPTIVNOE UPRAVLENIE PROGRAMMNYM DVIZHENIEM]
V. O. NIKIFOROV (Sankt-Petersburgskii Institut Tochnoi Mekhaniki i Optiki, St.Petersburg, Russia) Priborostroenie (ISSN 0021-3454), vol. 34, no. 5, 1991, p. 22-27. In Russian. 1991 6 p In RUSSIAN refs
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A method is proposed for the adaptive stabilization of the programmed motion of a perturbed nonlinear plant without using an additional reference model. The method uses a feedback based on deviations from the prescribed trajectory for parameter adjustment. An adaptive control problem is analyzed as an example. V.L.

A92-31998
STABILITY OF AUTOMATIC CONTROL SYSTEMS WITH A POLYNOMIAL MODEL [USTOICHIVOST' SISTEM AVTOMATICHESKOGO UPRAVLENIIA S POLINOMIAL'NOI MODEL'IU]
A. B. AMINOV (Kazanskii Aviatsionnyi Institut, Kazan, Russia) Avtomatika i Telemekhanika (ISSN 0005-2310), Oct. 1991, p. 44-51. In Russian. Oct. 1991 8 p In RUSSIAN refs
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The stability of automatic control systems with a polynomial model is investigated by using the Liapunov function method and conditions of the fixed sign of multiple-variable polynomials. Stability conditions are obtained, and the control time is estimated. The approach proposed here is illustrated by an example. V.L.

A92-31999
TWO-STAGE SOLUTION OF A PARTICULAR PROBLEM IN OPTIMAL TERMINAL GUIDANCE CONTROL SYNTHESIS [DVUKHETAPNOE RESHENIE CHASTNOI ZADACHI SINTEZA OPTIMAL'NOGO TERMINAL'NOGO UPRAVLENIIA]
S. N. KOVALENKO and V. N. TARAN (Rostovskoe VVKIU RV, Rostov-on-Don, Russia) Avtomatika i Telemekhanika (ISSN 0005-2310), Oct. 1991, p. 51-56. In Russian. Oct. 1991 6 p In RUSSIAN refs
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The problem of terminal guidance control synthesis for a nonlinear plant is investigated for the case of a linear (relative to the phase coordinates) functional and restricted control. A two-stage solution procedure is proposed which yields quasi-optimal control, with the specified terminal guidance conditions satisfied in a rigorous manner. The method is illustrated by an example. V.L.

A92-32001
GENERALIZED OPTIMIZATION IN OBSERVATION CONTROL PROBLEMS [OBOBSHCHENNAIA OPTIMIZATSIIA V ZADACHAKH UPRAVLENIIA NABLIUDENIIAMI]
B. M. MILLER (TsKB PO Krasnogorskii Zavod, Krasnogorsk, Russia) Avtomatika i Telemekhanika (ISSN 0005-2310), Oct. 1991, p. 83-92. In Russian. Oct. 1991 10 p In RUSSIAN refs
Copyright
The paper is concerned with the problem of optimizing observation of the paths of a continuous stochastic system in which the controls allow the selection of observation contents and their localization in time. A method for solving this problem is proposed whereby the problem is reduced to a common optimization problem with limited controls. Simultaneous process and observation control in a stochastic controlled system is examined as an example. V.L.

A92-32002
ADAPTIVE CORRECTION OF PARAMETRIC SYSTEMS [ADAPTIVNAIA KORREKTSIIA PARAMETRICHESKIKH SISTEM]
IU. V. KOZHEVNIKOV (Kazanskii Aviatsionnyi Institut, Kazan, Russia) Avtomatika i Telemekhanika (ISSN 0005-2310), Oct. 1991, p. 135-143. In Russian. Oct. 1991 9 p In RUSSIAN refs
Copyright
The problem considered here concerns the conversion of a linear dynamic system from an indeterminate initial state to an a priori unknown final optimal state through the consecutive correction of its parameters on the basis of the accumulating measurement data on the phase coordinates. The fast convergence of the adaptive solution procedure proposed here in the presence of stochastic perturbations, indeterminate noncorrectable system parameters, and random measurement errors is demonstrated. V.L.

A92-33677
PARAMETRIC OPTIMIZATION OF AUTOMATIC CONTROL SYSTEMS UNDER NONSTATIONARY RANDOM ACTIONS. I - LINEAR SYSTEMS [PARAMETRICHESKAIA OPTIMIZATSIIA SAU PRI NESTATSIONARNYKH SLUCHAINYKH VOZDEISTVIIAKH. I - LINEINYE SISTEMY]
A. D. ZHUKOV, I. A. ORURK, and I. A. OSIPOV (Institut Aviatsionnogo Priborostroeniia, St. Petersburg, Russia) Elektronnoe Modelirovanie (ISSN 0204-3572), vol. 14, Jan.-Feb. 1992, p. 33-37. In Russian. Feb. 1992 5 p In RUSSIAN refs
Copyright
A solution is obtained to the problem of the optimal synthesis of the parameters of a linear automatic control system according to integral estimates of the nonstationary random errors under constraints imposed on other quality indices. Use is made of Galerkin-method inversion, leading to the inverse dynamics problems, which is solved by a nonlinear programming approach. L.M.

A92-33740
CONCERNING THE CONTROL OF A GYROSCOPIC SYSTEM [K VOPROSU OB UPRAVLENII GIROSKOPICHESKOI SISTEMOI]
S. E. SAVCHENKOV Leningradskii Universitet, Vestnik, Matematika, Mekhanika, Astronomiia (ISSN 0024-0850), Oct. 1991, p. 62-64. In Russian. Oct. 1991 3 p In RUSSIAN
Copyright
The paper examines the reduction to zero of the kinetic moment of a system of gyrodynes when all the gyroscopes function effectively and when one of them fails. Two approaches to solving this problem are considered. L.M.

A92-33754
SYNTHESIS OF OPTIMAL DIGITAL SYSTEMS FOR THE STABILIZATION OF STOCHASTICALLY PERTURBED UNSTABLE DYNAMIC SYSTEMS [SINTEZ OPTIMAL'NYKH TSIFROVYKH SISTEM STABILIZATSII STOKHASTICHESKI VOZMUSHCHENNYKH NEUSTOICHIVYKH DINAMICHESKIKH OB'EKTOV]
V. V. BELAN, M. I. RYZHKOV, and A. A. TUNIK (Kievskii Institut Inzhenerov Grazhdanskoi Aviatsii, Kiev, Ukraine) Kibernetika i Vychislitel'naia Tekhnika (ISSN 0454-9910), no. 89, 1991, p. 10-15. In Russian. 1991 6 p In RUSSIAN refs
Copyright
The problem of the stabilization of a scalar unstable stochastically perturbed stationary linear plant is considered. The controller is synthesized for a discrete model in the frequency domain by the Wiener-Hopf method. As an example, attention is given to the synthesis of an optimal discrete system of helicopter stabilization with respect to the pitch angle, whose transfer function has an oscillatory instability. L.M.

A92-36539
A GROUP THEORY SOLUTION ALGORITHM FOR SOLVING OPTIMAL CONTROL SYNTHESIS PROBLEMS [TEORETIKO-GRUPPOVOI ALGORITM RESHENIIA ZADACH SINTEZA OPTIMAL'NOGO UPRAVLENIIA]
V. I. LEGEN'KII (Kievskoe Vysshee Voennoe Aviatsionnoe Inzhenernoe Uchilishche, Kiev, Ukraine) Kibernetika i Vychislitel'naia Tekhnika (ISSN 0454-9910), no. 91, 1991, p. 41-48. In Russian. 1991 8 p In RUSSIAN refs
Copyright
A group theory approach to the solution of synthesis problems in the optimal control of smooth dynamic systems is examined. An algorithm is proposed which reduces the synthesis problem to the Cauchy problem for a system of linear partial differential equations. The efficiency of the algorithm is demonstrated for model problems in flight dynamics. V.L.

A92-37028
CONTROL OF DISTRIBUTED PARAMETER SYSTEMS - LOCALISATION METHOD
V. D. IURKEVICH (Novosibirsk Institute of Electrical Engineering, Russia) IEE Proceedings, Part D - Control Theory and Applications (ISSN 0143-7054), vol. 139, no. 2, March 1992, p. 141-146. Mar. 1992 6 p refs
Copyright
In this paper, the problem of forming desired transients for systems which are governed by partial differential equations is discussed. It is assumed that information about external disturbances is incomplete and that there are finite dimensional controls. The design method called the localization method is used. Such problems as choices of structure of the control law, realizability conditions, control accuracy, influence of the differentiating filters and noises, are considered. Simulation results are also presented. Author

A92-37801
OPTIMAL CONTROL OF SYSTEMS DESCRIBED BY ORDINARY DIFFERENTIAL EQUATIONS WITH NONLINEAR CHARACTERISTICS OF THE HYSTERESIS TYPE. II [OPTIMAL'NOE UPRAVLENIE SISTEMAMI, OPISYVAEMYMI OBYKNOVENNYMI DIFFERENTSIAL'NYMI URAVNENIIAMI S NELINEINYMI KHARAKTERISTIKAMI GISTEREZISNOGO TIPA. II]
M. BROKATE Avtomatika i Telemekhanika (ISSN 0005-2310), no. 1, Jan. 1992, p. 3-40. In Russian. Jan. 1992 38 p In RUSSIAN refs
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The partial derivatives of g and g(epsilon) functions are

examined, and it is shown that the conjugate variables in the maximum principle for (P sub epsilon) are uniformly limited with respect to epsilon. The variation of the conjugate variables in (P sub epsilon) is analyzed. The discussion also covers the passage to the limit in the conjugate equation and the problem of speed of response for systems with hysteresis. V.L.

A92-37802
ROBUSTNESS OF LINEAR DYNAMIC SYSTEMS. II [O GRUBOSTI LINEINYKH DINAMICHESKIKH SISTEM. II]
M. E. BRAVERMAN and L. I. ROZONOER (Rossiiskaia Akademiia Nauk, Institut Problem Upravleniia, Moscow, Russia) Avtomatika i Telemekhanika (ISSN 0005-2310), no. 1, Jan. 1992, p. 41-52. In Russian. Jan. 1992 12 p In RUSSIAN refs
Copyright
A robustness criterion for linear stationary systems is formulated, and some of its corollaries are examined. Examples of robustness studies are presented, including systems with full compensation and synthesis of a specified transfer function for a closed-loop single-circuit system. V.L.

A92-37803
OPTIMAL FEEDBACK FOR A DISCRETE SYSTEM WITH PERTURBATION COMPENSATION. I - OPTIMAL ESTIMATOR SYNTHESIS [OPTIMAL'NAIA OBRATNAIA SVIAZ' DLIA DISKRETNOI SISTEMY S KOMPENSATSIEI VOZMUSHCHENII. I - SINTEZ OPTIMAL'NOGO ESTIMATORA]
R. GABASOV (Belorusskii Gosudarstvennyi Universitet, Minsk, Belarus), P. V. GAISHUN, F. M. KIRILLOVA, and S. V. PRISHCHEPOVA (AN Belarusi, Institut Matematiki, Minsk, Belarus) Avtomatika i Telemekhanika (ISSN 0005-2310), no. 1, Jan. 1992, p. 52-62. In Russian. Jan. 1992 11 p In RUSSIAN refs
Copyright
The optimal observation problem is investigated, and an algorithm is developed for optimal feedback synthesis for a linear discrete system exposed to measurable perturbations. The feedback includes an optimal estimator and an optimal controller. The estimator is synthesized in real time from exact perturbation values and inexact measurements of states. Based on this information, the controller provides optimal control. V.L.

A92-37804
PRACTICAL FEASIBILITY OF METHODS FOR THE IDENTIFICATION OF A LINEAR DYNAMIC PLANT FROM DATA ON ITS FUNCTIONING IN A CLOSED-LOOP CONTROL SYSTEM [K VOPROSU O PRAKTICHESKOI REALIZUEMOSTI METODOV IDENTIFIKATSII LINEINOGO DINAMICHESKOGO OB'EKTA PO DANNYM EGO FUNKTSIONIROVANIIA V ZAMKNUTOI SISTEME REGULIROVANIIA]
I. I. PEREL'MAN (Rossiiskaia Akademiia Nauk, Institut Problem Upravleniia, Moscow, Russia) Avtomatika i Telemekhanika (ISSN 0005-2310), no. 1, Jan. 1992, p. 72-86. In Russian. Jan. 1992 15 p In RUSSIAN refs
Copyright

A92-37805
ANALYSIS OF PROBABILITY-OPTIMIZED PROGRAMMED CONTROL PROBLEMS FOR A LINEAR SYSTEM WITH DISCRETE TIME [ANALIZ ZADACH OPTIMAL'NOGO PO VEROIATNOSTI PROGRAMMNOGO UPRAVLENIIA LINEINOI SISTEMOI S DISKRETNYM VREMENEM]
A. N. SIROTIN (Moskovskii Aviatsionnyi Institut, Moscow, Russia) Avtomatika i Telemekhanika (ISSN 0005-2310), no. 1, Jan. 1992, p. 86-96. In Russian. Jan. 1992 11 p In RUSSIAN refs
Copyright
An analysis is made of three types of probability-optimized control problems for linear autonomous systems under conditions of indeterminacy with discrete time in the presence of polyhedral constraints. Conditions of the existence of solutions that are independent of random interference distributions are determined. V.L.

A92-40712
IDENTIFICATION OF SYSTEMS WITH DISTRIBUTED PARAMETERS [OB IDENTIFIKATSII SISTEM S RASPREDELENNYMI PARAMETRAMI]
A. S. GRINBERG (NPO Tsentrsistem, Minsk, Belarus), V. A. LOTOTSKII (Rossiiskaia Akademiia Nauk, Institut Problem Upravleniia, Moscow, Russia), and B. SH. SHKLIAR (NPO Tsentrsistem, Minsk, Belarus) Avtomatika i Telemekhanika (ISSN 0005-2310), no. 2, Feb. 1992, p. 36-49. In Russian. Feb. 1992 14 p In RUSSIAN refs
Copyright
A new approach is proposed for the solution of the identification problem in a class of approximately controlled dynamic systems with distributed parameters. The approach is based on the analysis of identifiability using controllability criteria for a given plant. As a result of the analysis, it is determined whether a plant model with certain required properties can be synthesized, which is important from the standpoint of plant-oriented automation. Some particular cases are discussed. V.L.

A92-40713
ABSOLUTE STABILITY OF NONLINEAR NONSTATIONARY CONTROL SYSTEMS WITH A PERIODIC LINEAR COMPONENT [ABSOLIUTNAIA USTOICHIVOST' NELINEINYKH NESTATSIONARNYKH SISTEM UPRAVLENIIA S PERIODICHESKOI LINEINOI CHAST'IU]
A. P. MOLCHANOV and M. V. MOROZOV (Rossiiskaia Akademiia Nauk, Institut Problem Upravleniia, Moscow, Russia) Avtomatika i Telemekhanika (ISSN 0005-2310), no. 2, Feb. 1992, p. 49-59. In Russian. Feb. 1992 11 p In RUSSIAN refs
Copyright
For nonlinear nonstationary control systems with a periodic linear component, the equivalency of the properties of uniform absolute stability and uniform exponential absolute stability is demonstrated. It is shown that for the uniform absolute stability of this class of systems, the necessary and sufficient condition is the existence of a single time-periodic Liapunov function of the quasi-quadratic kind. The results are generalized to the case of periodic differential inclusions of a special kind. V.L.

A92-40716
LOCALLY OPTIMAL PSEUDODUAL CONTROL OF PLANTS WITH UNKNOWN PARAMETERS [LOKAL'NO-OPTIMAL'NOE PSEVDODUAL'NOE UPRAVLENIE OB'EKTAMI S NEIZVESTNYMI PARAMETRAMI]
E. V. BODIANSKII and M. D. BORIACHOK (Khar'kovskii Institut Radioelektroniki, Kharkov, Ukraine) Avtomatika i Telemekhanika (ISSN 0005-2310), no. 2, Feb. 1992, p. 90-97. In Russian. Feb. 1992 8 p In RUSSIAN refs
Copyright
A locally optimal pseudodual controller for plants with unknown parameters is proposed whose synthesis is based on the local optimization approach proposed by Kelmans et al. (1982) and the principle of active data accumulation. Consideration of parameter estimation errors in control synthesis makes it possible to improve the quality of control in comparison with controllers based on the separation principle. V.L.

A92-40722
THE EXISTENCE OF AN OPTIMAL SOLUTION TO THE CONTROL PROBLEM FOR SOME SYSTEMS WITH DELAY [O SUSHCHESTVOVANII OPTIMAL'NOGO RESHENIIA V ZADACHE UPRAVLENIIA NEKOTORYMI SISTEMAMI S ZAPAZDYVANIEM]
A. K. SPIVAK (AN Tadzhikistana, Matematicheskii Institut s Vychislitel'nym Tsentrom, Dushanbe, Tajikistan) Akademiia Nauk Tadzhikskoi SSR, Doklady (ISSN 0002-3469), vol. 34, no. 5, 1991, p. 282-285. In Russian. 1991 4 p In RUSSIAN refs
Copyright
A controlled system is considered whose motion is characterized by a constant delay. The existence of a permissible control is first proved. Based on the existence of a permissible control, the existence of an optimal control is then demonstrated. V.L.

A92-57442
A DECISION-MAKING SUBSYSTEM IN THE SYSTEM OF THE ACTIVE CONTROL OF THE STATE OF A DYNAMIC PLANT [PODSISTEMA PRINIATIIA RESHENII V SISTEME AKTIVNOGO KONTROLIA SOSTOIANIIA DINAMICHESKOGO OB'EKTA]
IU. V. TSURKAN and V. N. PANFEROV (AN Ukrainy, Institut Kibernetiki, Kiev, Ukraine) Kibernetika i Vychislitel'naia Tekhnika (ISSN 0454-9910), no. 92, 1991, p. 1-5. In Russian. 1991 5 p In RUSSIAN refs
Copyright
A simplified model is proposed which describes the decision-making subsystem within the system of the active control of the state of a dynamic plant. The model includes a mathematical description of the control moments and plant dynamics as well as a method for generating compensating action to counteract the failures of the control organs. V.L.

A92-57443
OPTIMAL CONTROL BASED ON THE METHOD OF INVERSE DYNAMICS PROBLEMS IN MAN-MACHINE SYSTEMS [OPTIMAL'NOE UPRAVLENIE NA OSNOVE METODA OBRATNYKH ZADACH DINAMIKI V CHELOVEKO-MASHINNYKH SISTEMAKH]
L. M. ARTIUSHIN and V. A. CHISTIAKOV (Kievskoe Vysshee Voennoe Aviatsionnoe Inzhenernoe Uchilishche, Kiev, Ukraine) Kibernetika i Vychislitel'naia Tekhnika (ISSN 0454-9910), no. 92, 1991, p. 11-15. In Russian. 1991 5 p In RUSSIAN refs
Copyright
A method for solving the optimum control problem by specifying the required dynamic properties of the system is examined which represents an extension of the method of inverse dynamics problems. The approach is applied to man-machine systems, and the efficiency of the method is illustrated by a specific example. V.L.

A92-57444
USING THE SIMULATION MODELING METHOD TO ESTIMATE THE RELIABILITY OF THE CREW-FLIGHT VEHICLE SYSTEM [PRIMENENIE METODA IMITATSIONNOGO MODELIROVANIIA DLIA OTSENKI NADEZHNOSTI SISTEMY EKIPAZH-LETATEL'NYI APPARAT]
V. A. KONDRATENKOV and G. A. TERESHKIN (Kievskoe Vysshee Voennoe Aviatsionnoe Inzhenernoe Uchilishche, Kiev, Ukraine) Kibernetika i Vychislitel'naia Tekhnika (ISSN 0454-9910), no. 92, 1991, p. 15-18. In Russian. 1991 4 p In RUSSIAN refs
Copyright
A mathematical model of the crew-flight vehicle system is developed using the principles of simulation modeling. The model is suitable for the evaluation of the reliability of a crew involved in compensation tracking. It is shown that the approach proposed here is more accurate than an analytical method for evaluating the reliability of the crew-vehicle system. V.L.

A92-57445
AN APPROACH TO THE ORGANIZATION OF AN ADAPTIVE MAN-MACHINE SYSTEM FOR FLIGHT VEHICLE CONTROL [OB ODNOM PODKHODE K ORGANIZATSII ADAPTIVNOI ERGATICHESKOI SISTEMY UPRAVLENIIA LETATEL'NYM APPARATOM]
A. V. KHARCHENKO (Kievskoe Vysshee Voennoe Aviatsionnoe Inzhenernoe Uchilishche, Kiev, Ukraine) Kibernetika i Vychislitel'naia Tekhnika (ISSN 0454-9910), no. 92, 1991, p. 21-23. In Russian. 1991 3 p In RUSSIAN refs
Copyright
A bioengineering approach to the organization of an adaptive man-machine system for flight vehicle control is examined which is based on a rational combination of the adaptive capacity of the pilot and automation. The proposed combination of biological and technological adaptation within a single system makes it possible to maximize the advantages of the two types of adaptation while minimizing their disadvantages. The approach proposed here provides for flexible distribution of control functions between the pilot and the automatic control system. V.L.

A92-57447
CONTROL OF THE MOTION OF A SYSTEM OF LIFTING BODIES WITH A SINGLE LOAD ON A COMMON EXTERNAL SUSPENSION [K VOPROSU UPRAVLENIIA DVIZHENIEM SISTEMY NESUSHCHIKH TEL S MONOGRUZOM NA OBSHCHEI VNESHNEI PODVESKE]
O. IU. IL'IN (Kievskoe Vysshee Voennoe Aviatsionnoe Inzhenernoe Uchilishche, Kiev, Ukraine) Kibernetika i Vychislitel'naia Tekhnika (ISSN 0454-9910), no. 92, 1991, p. 57-62. In Russian. 1991 6 p In RUSSIAN refs
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Control synthesis methods for a complex mechanical system with a priori known characteristics are proposed. The control synthesis approach proposed here is based on the method of inverse dynamics problems. Control synthesis for a system of lifting bodies with a single load on a common external suspension is examined as an example. V.L.

A92-57498
COMPUTATIONAL METHODS OF SUCCESSIVE ELIMINATION AND OPTIMIZATION IN A STOCHASTIC OPTIMAL CONTROL MODEL [VYCHISLITEL'NYE METODY POSLEDOVATEL'NYKH ISKLIUCHENII I OPTIMIZATSII V MODELI STOKHASTICHESKOGO OPTIMAL'NOGO UPRAVLENIIA]
V. V. BARANOV Zhurnal Vychislitel'noi Matematiki i Matematicheskoi Fiziki (ISSN 0044-4669), vol. 32, no. 2, Feb. 1992, p. 247-260. In Russian. Feb. 1992 14 p In RUSSIAN refs
Copyright
Criteria are formulated which make it possible to reduce the set of possible controls by eliminating those controls that are known a priori to be unpromising. The successive elimination of the unpromising control reduces the computational effort at each iteration, resulting in a significant reduction of the total volume of computations. This approach makes it possible to solve problems of large dimensionality, which is important in optimal stochastic control. V.L.

N92-17814# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics.
MICROPROCESSOR CONTROLLER IN CAMAC STANDARD FOR TEMPERATURE REGULATION AND STABILIZATION
NGUYEN NHI DIEN and K. G. RODIONOV 1990 11 p In RUSSIAN; ENGLISH summary
(DE92-611158; JINR-R-10-90-398) Avail: CASI HC A03/MF A01
The microprocessor controller in CAMAC standard for temperature regulation and stabilization of an external object (electric furnace, thermostat) is described. The controller has two control regimes, parallel and serial, and was controlled by personal computer PC/XT/AT. The apparatus that was created and the software supply, allow the temperature of the sample to be linearly raised or lowered to: indicated value with different rates; stabilize temperature on a set level; and record a graph of current temperature both at the time of heating or cooling and at the time of stabilization with a different frequency that is set by the program. DOE

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NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

A92-10840
APPLICATION OF CONTINUED MATRIX FRACTIONS TO THE ANALYSIS OF STOCHASTIC SYSTEMS WITH POLYNOMIAL NONLINEARITY [PRIMENENIE MATRICHNYKH TSEPNYKH DROBEI K ANALIZU STOKHASTICHESKIKH SISTEM S POLINOMIAL'NOI NELINEINOST'IU]
O. V. MUZYCHUK Prikladnaia Matematika i Mekhanika (ISSN

0032-8235), vol. 55, July-Aug. 1991, p. 620-625. In Russian. Aug. 1991 6 p In RUSSIAN refs
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A stochastic system is considered which represents a nonlinear-stiffness oscillator with nonlinear damping exposed to a Gaussian delta-correlated random force. The nonlinearities are approximated by polynomials. Vectors are introduced whose components represent stationary moment values of the output coordinate. For these, three-term interaction chains are obtained in the context of the Markov theory which can be solved in the form of continued matrix fractions. The convergence of such fractions to exact results is investigated numerically using specific examples. V.L.

A92-15094
RATIONAL NUMERICAL MODELING IN NONLINEAR MECHANICS [RATSIONAL'NOE CHISLENNOE MODELIROVANIE V NELINEINOI MEKHANIKE]
O. M. BELOTSERKOVSKII, ED. Moscow, Izdatel'stvo Nauka, 1990, 128 p. In Russian. For individual items see A92-15095 to A92-15099. 1990 128 p In RUSSIAN
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The papers contained in this volume focus on new approaches to the numerical modeling of problems in fluid mechanics. The discussion covers the main principles of rational numerical modeling and implementation of these principles to a wide range of both traditional and nontraditional problems in continuum mechanics. Applications discussed include aerodynamics and medicine. V.L.

A92-15095
PRINCIPLES OF RATIONAL NUMERICAL MODELING IN AEROHYDROMECHANICS [PRINTSIPY RATSIONAL'NOGO CHISLENNOGO MODELIROVANIIA V AEROGIDROMEKHANIKE]
O. M. BELOTSERKOVSKII and V. V. SHCHENNIKOV IN: Rational numerical modeling in nonlinear mechanics 1990 18 p In RUSSIAN refs
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Some principles of rational numerical modeling and implementations of these principles are examined with particular reference to the solution of problems in aerohydrodynamics described by Euler equations. In particular, attention is given to the principle of evolutionary indeterminacy, the discrete model assemblage principle, and the asymptotic stability and dissipation principles. V.L.

A92-16826
A STUDY OF A VERSION OF THE BOUNDARY CONDITIONS OF A TWO-DIMENSIONAL SPLINE IN SURFACE AND LINE MODELING [ISSLEDOVANIE VARIANTA KRAEVYKH USLOVII DVUMERNOGO SPLAINA PRI MODELIROVANII POVERKHNOSTEI I OBVODOV]
A. N. ROTKIN, V. F. SNIGIREV, and V. G. SHATAEV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 4, 1990, p. 93-96. In Russian. 1990 4 p In RUSSIAN refs
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The use of splines for the interpolation and approximation of surfaces is examined, and the associated errors are discussed. In particular, results of a numerical experiment concerned with the spline interpolation of surfaces using rectangular finite elements are presented for two versions of spline functionals. Both versions demonstrate practically the same convergence. V.L.

A92-23415
ON A SPECTRAL-ELEMENT NUMERICAL METHOD FOR THE SOLUTION OF INITIAL BOUNDARY VALUE PROBLEMS
E. S. AVILOVA and A. S. SOLOV'EV (AN SSSR, Institut Teoreticheskoi i Prikladnoi Mekhaniki, Novosibirsk, USSR) Russian Journal of Theoretical and Applied Mechanics (ISSN 1051-8045), vol. 1, Dec. 1991, p. 383-394. Dec. 1991 12 p refs
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The spectral-element Chebyshev method for solving linear boundary value problems involving ordinary differential equations is extended to initial-boundary value problems governed by nonlinear unsteady partial differential equations. An initial boundary value problem for the Burgers equation is considered as an example to demonstrate the efficiency of the approach. The advantages of the method are summarized. V.L.

A92-24905
ON AN ADAPTIVE NUMERICAL METHOD FOR SOLUTION OF HIGH GRADIENT PROBLEMS
A. N. KUDRIAVTSEV and A. S. SOLOV'EV (Academy of Sciences of the USSR, Institute of Theoretical and Applied Mechanics, Novosibirsk) Russian Journal of Theoretical and Applied Mechanics (ISSN 1051-8045), vol. 1, Sept. 1991, p. 265-272. Sep. 1991 8 p refs
Copyright

A new numerical method for the solution of initial boundary-value problems is proposed. Spatial derivatives are approximated by finite-difference formulas on nonuniform grids. Grid nodes in the course of computing concentrate in high-gradient regions. The explicit time-integration scheme is constructed so that stability restrictions on the time step are sufficiently weaker. By means of test computations for the one-dimensional Burgers' equation, the efficiency of the method is demonstrated. Author

A92-26218
DOMAIN DECOMPOSITION METHODS FOR UNSTEADY CONVECTION-DIFFUSION PROBLEMS
IU. A. KUZNETSOV (AN SSSR, Moscow, USSR) IN: Computing methods in applied sciences and engineering; Proceedings of the 9th International Conference, Paris, France, Jan. 29-Feb. 2, 1990 1990 17 p refs
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This paper deals with systems of linear algebraic equations arising in application of the finite element method to elliptic boundary value problems with singularly perturbed operators. These problems appear in utilization of implicit difference methods for solving parabolic equations including unsteady convection-diffusion problems. To solve FEM-systems, the paper suggests both iterative methods with multilevel domain decomposition (DD) preconditioners and noniterative DD-methods with overlapping subdomains. The latter methods exploit the property of fast exponential decay and grid Green's functions of singularly perturbed elliptic operators. The justification and practical implementation of the DD-methods suggested are discussed. Author

A92-33758
ITERATIVE METHOD OF OPTIMIZATION IN THE PRESENCE OF CONSTRAINTS USING NONORTHOGONAL PROJECTION OPERATORS [ITERATSIONNYI METOD OPTIMIZATSII PRI NALICHII OGRANICHENII S ISPOL'ZOVANIEM OPERATOROV NEORTOGONAL'NOGO PROEKTIROVANIIA]
L. M. BOICHUK (AN Ukrainy, Institut Kibernetiki, Kiev, Ukraine) Kibernetika i Vychislitel'naia Tekhnika (ISSN 0454-9910), no. 89, 1991, p. 52-58. In Russian. 1991 7 p In RUSSIAN refs
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A92-42783
SOME ASPECTS OF THE THEORY OF DIFFERENTIAL EQUATIONS AND APPLICATIONS TO MECHANICS [NEKOTORYE VOPROSY TEORII DIFFERENTSIAL'NYKH URAVNENII I PRILOZHENIIA V MEKHANIKE]
NIKOLAI P. VEKUA Moscow, Izdatel'stvo Nauka, 1991, 256 p. In Russian. 1991 256 p In RUSSIAN
(ISBN 5-02-014278-6) Copyright

Basic concepts, definitions, and problems in the theory of differential equations that are relevant to the classical and current fields of theoretical mechanics are examined. Particular attention is given to the analysis of the laws of motion of material points, including material points of variable mass, and the associated reactive forces. The importance of reactive forces for achieving space velocities is demonstrated. The discussion also covers some aspects of the theory of space motion, special relativity, and stability theory. V.L.

A92-51353
FINITE ELEMENT DISCRETIZATION OF A PARABOLIC EQUATION WITH A DISCONTINUOUS SOLUTION [DISKRETIZATSIIA METODOM KONECHNYKH ELEMENTOV URAVNENIIA PARABOLICHESKOGO TIPA S RAZRYVNYM RESHENIEM]
V. V. SKOPETSKII, V. S. DEINEKA, and A. L. ARTEMENKO (Kievskii Gosudarstvennyi Universitet, Kiev, Ukraine) Vychislitel'naia i Prikladnaia Matematika (ISSN 0321-4117), no. 68, 1989, p. 77-85. In Russian. 1989 9 p In RUSSIAN refs
Copyright
A finite element algorithm is developed for solving the initial/boundary value problem for a parabolic equation with a solution that is discontinuous with respect to three-dimensional variables. Theorems are proved on the convergence of an approximate solution. Numerical solutions of model problems are presented as an example. V.L.

A92-52769
INVESTIGATION OF SHOCK WAVE STRUCTURES BY MALFORANT CELL AND FREE CELL SCHEMES OF DSMC
S. F. GIMEL'SHEIN, M. S. IVANOV (Russian Academy of Sciences, Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia), and S. V. ROGASINSKII (Russian Academy of Sciences, Computing Center, Novosibirsk, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 10 p refs
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The direct statistical simulation method based on the majorant frequency principle is used to compare the variable hard sphere (VHS) model with the inverse power potential of intermolecular interaction that has different cutoff parameters in the problem on shock structure within a wide range of Mach numbers. The influence on the flow properties of the particle statistical dependence is studied. New approaches for estimating the particle statistical dependence are proposed based on calculation of the repeated collision number and the correlator G2. Shock structure calculations at a small particle number are presented. Author

N92-14704# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. Teoreticheskoj i Ehksperimentalnoj Fiziki.
HAMILTONIAN REDUCTION OF WESS-ZUMINO-WITTEN THEORY FROM THE POINT OF VIEW OF BOSONIZATION
A. GERASIMOV, A. MOROZOV (Academy of Sciences, USSR, Moscow), and A. MARSHAKOV 1989 9 p
(DE91-634069; ITEP-139-89) Avail: CASI HC A02/MF A01
Representation of Kac-Moody algebra in terms of free fields as applied to the minimal models is considered. Hamiltonian reduction of the Wess-Zumino-Witten model is performed from the viewpoint of bosonization, consisting in expressing many-loop correlators through free field correlators on Riemann surface.
DOE

N92-15627# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy.
THE SOLUTION OF LEAST SQUARES PROBLEMS BY STANDARD AND SVD CODES
V. I. ILYUSHCHENKO and P. KOZMA 1989 4 p
(DE91-635955; JINR-E-10-89-521) Avail: CASI HC A01/MF A01
The method of singular value decomposition (SVD) is used to solve the least squares problem (Ax=b) in a general manner. This method produces the full set of searched for parameters, x. The only technical peculiarity of this method consists in transforming an initial analytical fitting formula into the appropriate design matrix, A. A combination of any SVD code with a standard one, e.g., MINUIT, provides a reliable tool to crosscheck the obtained results. DOE

N92-15628# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation.
NONLINEAR EVOLUTION EQUATIONS AND SOLVING ALGEBRAIC SYSTEMS: THE IMPORTANCE OF COMPUTER ALGEBRA
V. P. GERDT (Joint Inst. for Nuclear Research, Dubna (USSR).), N. A. KOSTOV (Joint Inst. for Nuclear Research, Dubna (USSR).), and A. YU. ZHARKOV (Saratov N. G. Chernyshevsky State Univ., Astrakhanskaya, USSR) 1989 16 p
(DE91-635951; JINR-E-5-89-624) Avail: CASI HC A03/MF A01
The application of computer algebra to solve the nonlinear polynomial systems which arise in investigation of nonlinear evolution equations is studied. We consider several systems which are obtained in classification of integrable nonlinear evolution equations with uniform rank. Other polynomial systems are related with the finding of algebraic curves for finite-gap elliptic potentials of Lame type and generalizations. All systems under consideration are solved using the method based on construction of the Groebner basis for corresponding polynomial ideals. The computations have been carried out using computer algebra systems. DOE

N92-16679# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
NEW METHOD FOR SOLVING THREE-DIMENSIONAL SCHROEDINGER EQUATION
V. S. MELEZHIK 1990 10 p Submitted for publication
(DE92-600141; JINR-E-4-90-294) Avail: CASI HC A02/MF A01
The method derived recently for solving a multidimensional scattering problem is applied to a three-dimensional Schroedinger equation. As compared with direct three-dimensional calculations of finite elements and finite differences, this approach gives sufficiently accurate upper and lower approximations to the helium-atom binding energy, which demonstrates its efficiency.
DOE

N92-18147# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation.
MULTICHANNEL SCATTERING PROBLEM AS A NONLINEAR BOUNDARY VALUE PROBLEM
T. ZHANLAV and I. V. PUZYNIN 1990 9 p In RUSSIAN; ENGLISH summary
(DE92-609057; JINR-R-11-90-382) Avail: CASI HC A02/MF A01
The computational scheme for solving the scattering problem based on its representation as a nonlinear boundary value problem for a multichannel case is generalized. The spline-function method and the continuous analog of the Newton method including the perturbation operator are used for the numerical solution of the obtained nonlinear problem. The proposed scheme has an accuracy of 0(h sup 4), where h is a step of a uniform mesh. DOE

N92-19884# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Ehnergij.
LAGRANGIAN FORMALISM FOR CONSTRAINED SYSTEMS, PART 1
P. N. PYATOV 1990 46 p Submitted for publication
(DE92-608011; IHEP-OTF-90-35-PT-1; IFVE-OTF-90-35-PT-1)
Avail: CASI HC A03/MF A01
A scheme for the construction of a complete set of Lagrangian constraints applicable to a wide class of Lagrangian mechanical systems is given. In the framework of this scheme Lagrangian constraints are split into projectable and nonprojectable ones (in the sense of Legendre mapping). The role of both of these types of constraints in the given formalism is elucidated. Secondary, tertiary, etc. Hamiltonian constraints are obtained by mapping the projectable Lagrangian constraints onto the surface of primary Hamiltonian constraints in the phase space. DOE

N92-70101 Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation.
NUMERICAL SOLUTION TO THE SCATTERING PROBLEM WITH COMPLEX POTENTIAL
T. ZHANLAV and I. V. PUZYNIN 1989 8 p
(DE91-633976; JINR-R-11-89-643) Avail: CASI HC A02/MF A01

A numerical method for solving the scattering problem for the radial Schroedinger equation with complex potential is presented. The statement of this problem as a nonlinear boundary value problem is given. In order to solve the problem numerically, the latter is approximated by the spline-function method and the iteration scheme of generalized continuous analog of the Newton method is used. DOE

N92-70215 Academy of Sciences (USSR), Novosibirsk. Inst. Yadernoj Fiziki.
INTEGRABILITY OF EQUATIONS FOR SOLITON'S EIGENFUNCTIONS
B. G. KONOPELCHENKO 1989 14 p
(DE91-642792; IYAF-89-150) Avail: CASI HC A03/MF A01

Eigenfunctions of the auxiliary linear problems for the soliton equations obey the nonlinear evolution equations. It is shown that these eigenfunction equations are integrable by the inverse spectral transform method. Eigenfunction equations are also the generating equations. Several (1+1) and (2+1) dimensional eigenfunction equations and their properties are considered. DOE

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STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

A92-36417
NONPARAMETRIC METHODS OF REGRESSION ANALYSIS IN PROBLEMS RELATED TO THE PROCESSING OF AERODYNAMIC BALANCE CALIBRATION TESTS [NEPARAMETRICHESKIE METODY REGRESSIONNOGO ANALIZA V ZADACHAKH OBRABOTKI KALIBROVOCHNYKH ISPYTANII AERODINAMICHESKIKH VESOV]
V. A. VASENIN and A. A. MAKAROV Moskovskii Universitet, Vestnik, Seriia 1 - Matematika, Mekhanika (ISSN 0579-9368), no. 1, Jan.-Feb. 1992, p. 58-64. In Russian. Feb. 1992 7 p In RUSSIAN refs
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The application of nonparametric methods of linear regression analysis to the processing of calibration test results for the measurement circuit of automatic control systems using aerodynamic scales as the primary measurement device is discussed. A nonparametric method for estimating the inclination angle in the problem of simple linear regression is proposed. The advantages of the method over the traditional approach are discussed, and the efficiency of the method is demonstrated by an example. V.L.

A92-40652
DUAL ALGORITHMS OF OPTIMAL GUARANTEED ESTIMATION [DVOISTVENNYE ALGORITMY OPTIMAL'NOGO GARANTIRUIUSHCHEGO OTSENIVANIIA]
V. N. SOLOV'EV Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 30, no. 1, Jan.-Feb. 1992, p. 10-24. In Russian. Feb. 1992 15 p In RUSSIAN refs
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The problem of calculating a linear unbiased estimate having minimum guaranteed variance is reduced to the problem of minimizing a differentiable convex function on the state space. Calculation algorithms are given for a few fairly general statistical constraints on the observation errors. Nonoptimality estimates for the least squares method are obtained. L.M.

N92-14749# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
STOCHASTICITY IN THE SPECTRUM OF SOME HAMILTONIANS WITH DISCRETE SYMMETRY
YU. L. BOLOTIN (Joint Inst. for Nuclear Research, Moscow (USSR).), V. YU. GONCHAR (Joint Inst. for Nuclear Research, Moscow (USSR).), and V. N. TARASOV (Academy of Sciences of the Ukrainian SSR, Kharkov.) 1989 26 p In RUSSIAN; ENGLISH summary
(DE91-628033; JINR-R-4-89-590) Avail: CASI HC A03/MF A01

A new quantization of C sub 3v-invariant classical Hamiltonian using Birghoff-Gustavson's normal form is proposed. The introduction of the polar coordinates in the phase space simplifies the normal form and its quantal analogue. A simple quasiclassical analytic formula for the spectrum of collective quadrupole excitations of nuclei is obtained. This formula fits well to the exact level spacing in the energy region where the regular classical motion is prevailing. A C sub 4v-symmetric classical and quantum Hamiltonians are studied too. The presence of chaotic motion in the case of potential function with a negative Gaussian curvature and the regularity of motion for the remaining cases is demonstrated. The critical energy for transition to chaos coincides with that obtained via Poincare sections and other methods. The role of the C sub 4v symmetry in the statistical distributions of the energy levels is discussed and the universality of the spectrum fluctuation laws is reestablished. DOE

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PHYSICS (GENERAL)

A92-10836
BIFURCATION AND STABILITY OF THE RELATIVE EQUILIBRIUMS OF A SATELLITE-GYROSTAT [O VETVLENII I USTOICHIVOSTI OTNOSITEL'NYKH RAVNOVESII SPUTNIKA-GIROSTATA]
V. N. RUBANOVSKII Prikladnaia Matematika i Mekhanika (ISSN 0032-8235), vol. 55, July-Aug. 1991, p. 565-571. In Russian. Aug. 1991 7 p In RUSSIAN refs
Copyright

The bifurcation and stability of the relative equilibriums of a satellite-gyrostat are investigated in the case where the rotor axis is not located in the main planes of the central triaxial inertia ellipsoid of the system. The results are presented in the form of a bifurcation diagram in which the distribution of the instability of the relative equilibriums is governed by the general laws of bifurcation theory. The bifurcation parameter used in the analysis is the gyrostatic moment of the rotor. V.L.

A92-15001
DYNAMIC PROCESSES IN GASES AND SOLID BODIES [DINAMICHESKIE PROTSESSY V GAZAKH I TVERDYKH TELAKH]
B. V. FILIPPOV, ED. and S. K. MATVEEV, ED. (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR) Leningrad, Izdatel'stvo Leningradskogo Universiteta (Fizicheskaia Mekhanika, No. 6), 1990, 216 p. In Russian. For individual items see A92-15001 to A92-15016. 1990 216 p In RUSSIAN
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The papers contained in this volume provide an overview of recent theoretical and experimental research concerned with nonequilibrium processes in gases, multiphase systems, plasmas, and solids. Topics discussed include direct variational methods for the analysis of one-dimensional explosion problems; structure of shock waves in gases and suspensions of matter in gas; determination of the parameters of chemically reacting gases behind shock waves; and aerodynamic characteristics of positively charged bodies moving in a strongly rarefied plasma. Papers are also presented on the numerical modeling of the longitudinal dynamics of beams of charged particles in plasma; a study of flow of magnetic fluids in capillaries and porous bodies; and interaction of a multicomponent molecular-atomic beam with a

relaxing adsorption layer with allowance for surface chemical reactions. V.L.

A92-16707
STABILITY OF THE UNIFORM ROTATIONS OF A GYROSTAT ABOUT THE MAIN VERTICAL AXIS ON A HORIZONTAL PLANE WITH VISCOUS FRICTION [USTOICHIVOST' RAVNOMERMOGO VRASHCHENIIA GIROSTATA VOKRUG VERTIKAL'NOI GLAVNOI OSI NA GORIZONTAL'NOI PLOSKOSTI S VIAZKIM TRENIEM]
S. A. BELIKOV Akademiia Nauk SSSR, Izvestiia, Mekhanika Tverdogo Tela (ISSN 0572-3299), Sept.-Oct. 1991, p. 3-8. In Russian. Oct. 1991 6 p In RUSSIAN refs
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Equations describing the motion of a gyrostat on a supporting surface are obtained in the form of a tenth-order system with three cyclic variables. The equations allow a particular solution in which the gyrostat's center of mass is stationary while the body rotates uniformly about the vertical main axis coincident with the rotor's uniform rotation axis. Equations of the perturbed motions of the system are derived in the vicinity of the corresponding equilibrium in the form of a seventh-order system with dimensionless variables and parameters. A characteristic equation is also written for the system which has a simple zero root. V.L.

A92-21627
STATIONARY REGIMES AND REGIMES REDUCIBLE TO THE STATIONARY STATE IN NORMAL STOCHASTIC DIFFERENTIAL SYSTEMS [O STATSIONARNYKH I PRIVODIMYKH K STATSIONARNYM REZHIMAKH V NORMAL'NYKH STOKHASTICHESKIKH DIFFERENTSIAL'NYKH SISTEMAKH]
N. K. MOSHCHUK and I. N. SINITSYN Prikladnaia Matematika i Mekhanika (ISSN 0032-8235), vol. 55, Nov.-Dec. 1991, p. 895-903. In Russian. Dec. 1991 9 p In RUSSIAN refs
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The paper is concerned with stationary (in the narrow sense) regimes in multidimensional nonlinear normal systems described by Ito's stochastic differential equations with Wiener processes. Conditions for the existence of one-dimensional stationary distributions and distributions reducible to the stationary type are determined. Exact expressions are obtained for stationary distributions in certain mechanical systems. V.L.

A92-33764
OPTIMIZATION IN HARDY SPACE AND THE PROBLEM OF CONTROLLER OPTIMIZATION (REVIEW) [OPTIMIZATSIIA V PROSTRANSTVE KHARDI I PROBLEMA PARAMETRIZATSII REGULIATOROV /OBZOR/]
V. B. LARIN (AN Ukrainy, Institut Mekhaniki, Kiev, Ukraine) Prikladnaia Mekhanika (ISSN 0032-8243), vol. 28, Feb. 1992, p. 3-21. In Russian. Feb. 1992 19 p In RUSSIAN refs
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Problems related to optimization in Hardy space H2 are examined with particular reference to approaches based on the Wiener-Kolmogorov and Wiener-Hopf methods. The existing parametrization procedures for sets of stabilizing controllers are compared. The use of the LQG approach and H2 optimization in applied problems is discussed using specific examples. Consideration is also given to the solution of the Riccati algebraic equation and factorization of matrix polynomials. V.L.

A92-33787
OPTIMAL CONTROL OF RIGID BODY ORIENTATION IN A CENTRAL FORCE FIELD [OPTIMAL'NOE UPRAVLENIE ORIENTATSIEI TVERDOGO TELA V TSENTRAL'NOM SILOVOM POLE]
V. I. GULIAEV, V. L. KOSHKIN, and I. K. VALEEVA (Kievskii Inzhenerno-Stroitel'nyi Institut, Kiev, Ukraine) Mekhanika Giroskopicheskikh Sistem (ISSN 0203-3771), no. 10, 1991, p. 60-66. In Russian. 1991 7 p In RUSSIAN refs
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The paper is concerned with the problem of the speed-optimized control of the spatial turning maneuver of a rigid body in a central force field using small reactive moments. For a rigid body with a triaxial inertia ellipsoid, this problem is shown to be a multiple-extreme problem. Three locally optimal control programs are presented. V.L.

A92-36416
THE PROBLEM OF BODY MOTION IN A MEDIUM WITH RESISTANCE [K ZADACHE O DVIZHENII TELA V SREDE S SOPROTIVLENIEM]
M. V. SHAMOLIN Moskovskii Universitet, Vestnik, Seriia 1 - Matematika, Mekhanika (ISSN 0579-9368), no. 1, Jan.-Feb. 1992, p. 52-58. In Russian. Feb. 1992 7 p In RUSSIAN refs
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A model version of the interaction of a body with a resistant medium is analyzed in qualitative terms. For plane parallel motion, the case of the constant velocity of the center of mass is considered in detail. The existence of nonisolated periodic solutions, absence of limiting cycles, and transcendental integrability are proved. The necessary and sufficient conditions are presented for the expression of the integral in terms of elementary functions. V.L.

A92-36541
LOW-FREQUENCY STEADY STATE VIBRATIONS OF NONLINEAR OSCILLATORS WITH HIGH-FREQUENCY PUMPING [NIZKOCHASTOTNYE STATSIONARNYE KOLEBANIIA NELINEINYKH OSTSILLIATOROV S VYSOKOCHASTOTNOI NAKACHKOI]
IU. A. VOSHCHINSKII, IU. A. KRAVTSOV, A. S. MAGARSHAK, A. IU. SINKEVICH, and D. M. SHTEINGRADT (Namanganskii Gosudarstvennyi Pedagogicheskii Institut, Namangan, Uzbekistan) Kibernetika i Vychislitel'naia Tekhnika (ISSN 0454-9910), no. 91, 1991, p. 75-78. In Russian. 1991 4 p In RUSSIAN refs
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A study is made of the steady state vibrations of nonlinear nonatonomous oscillators with arbitrary coordinate and velocity dependences of friction and amplitude of high-frequency pumping. General equations are obtained for the stationary amplitudes and the required pump phase. The stability conditions of these oscillations are determined. V.L.

A92-42732
MINIMUM-DRAG BODIES MOVING IN LOCALITY-LAW MEDIA [O TELAKH NAIMEN'SHEGO SOPROTIVLENIIA, DVIGAIUSHCHIKHSIA V SREDAKH PRI NALICHII ZAKONA LOKAL'NOSTI]
N. A. OSTAPENKO and G. E. IAKUNINA Rossiiskaia Akademiia Nauk, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), no. 1, Jan.-Feb. 1992, p. 95-106. In Russian. Feb. 1992 12 p In RUSSIAN refs
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A solution is presented for the variational problem of a minimum-drag body moving with a constant velocity in a medium in which the force exerted by the medium on an elementary surface area unit of the body depends only on its orientation relative to the motion direction (locality law). The representations of the normal (pressure) and tangential (friction) components of the force cover a wide range of conditions that are realized during the motion of a body in gases and dense media. V.L.

A92-42778
LOCAL INTERACTION THEORY [TEORII LOKAL'NOGO VZAIMODEISTVIIA]
ROMAN N. MIROSHIN and ISKANDER A. KHALIDOV Leningrad, Izdatel'stvo Leningradskogo Universiteta, 1991, 276 p. In Russian. 1991 276 p In RUSSIAN refs
(ISBN 5-288-00516-8) Copyright
A mathematical formalism for models of local interaction between a body and a medium is developed which makes it possible to expand the range of problems that can be solved. Such problems include analytical estimation of the response of a medium to a body and reconstruction of the local characteristics or shape of a body from global characteristics. The discussion

covers the fundamentals of the theory of local interaction, relationship between local interaction theory and the problem of Markov moments, direct and inverse problems of local interaction, and aerodynamic applications. V.L.

N92-14776# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: PHYSICS AND MATHEMATICS
3 Dec. 1991 44 p Transl. into ENGLISH of various Russian articles
(JPRS-UPM-91-007) Avail: CASI HC A03/MF A01
Abstracts of Soviet publications in various areas of physics and mathematics are presented. The areas covered include: acoustics, lasers, nuclear physics, optics, spectroscopy, superconductivity, plasma physics, and thermodynamics. K.S.

N92-14777# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: PHYSICS AND MATHEMATICS
16 Sep. 1991 43 p Transl. into ENGLISH of various Russian articles
(JPRS-UPM-91-006) Avail: CASI HC A03/MF A01
Abstracts of Soviet publications in various areas of physics and mathematics are presented. The areas covered include: lasers, nuclear physics, optics, spectroscopy, plasma physics, and superconductivity. K.S.

N92-17811# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation.
ON THE NONADIABATIC THEORY OF CHARGED PARTICLES MOTION IN THE MAGNETIC DIPOLE FIELD
I. V. AMIRKHANOV (Joint Inst. for Nuclear Research, Dubna (USSR).), E. P. ZHIDKOV (Joint Inst. for Nuclear Research, Dubna (USSR).), A. N. ILINA (Joint Inst. for Nuclear Research, Dubna (USSR).), V. D. ILIN (Joint Inst. for Nuclear Research, Dubna (USSR).), and B. YU. YUSHKOV (Moscow State Univ., USSR) 1990 10 p In RUSSIAN; ENGLISH summary
(DE92-610951; JINR-R-9-90-154) Avail: CASI HC A02/MF A01
The question of a nonadiabatic model of particle motion in the dipole field is considered. By applying the concepts of the leading line, the magnetic moment and the loss cone, an analogy to traditional ideas of the adiabatic motion theory for trapped particles of high energy is determined through numerical experiment. DOE

N92-22312# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: PHYSICS AND MATHEMATICS
16 Mar. 1992 47 p Transl. into ENGLISH from various Russian articles
(JPRS-UPM-92-002) Avail: CASI HC A03/MF A01
A bibliography is given of Central Eurasian research in physics and mathematics. Topics covered include acoustics, crystals, laser glasses, semiconductors, differential equations, theoretical physics, thermodynamics, superconductivity, plasma physics, optics, spectroscopy, nuclear physics, lasers, and fluid dynamics. Author

N92-22394# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: PHYSICS AND MATHEMATICS
15 Jan. 1992 34 p Transl. into ENGLISH from various Russian articles
(JPRS-UPM-92-001) Avail: CASI HC A03/MF A01
A bibliography of Central Eurasian research in physics and mathematics is given. Topics covered include acoustics, crystals, laser glasses, semiconductors, lasers, nuclear physics, optics, spectroscopy, plasma physics, superconductivity, and thermodynamics. Author

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ACOUSTICS

Includes sound generation, transmission, and attenuation.

A92-30143
REDUCING THE BACKGROUND NOISE LEVEL IN THE TEST SECTION OF A WIND TUNNEL FOR TRANSONIC FLOW VELOCITIES [SNIZHENIE UROVNIA FONOVOGO SHUMA V RABOCHEI CHASTI AERODINAMICHESKOI TRUBY PRI TRANSZVUKOVYKH SKOROSTIAKH POTOKA]
A. G. EREZA, V. G. MIKELADZE, A. G. MUNIN, E. P. STOLIAROV, R. D. FILIPPOVA, and A. N. SHLIAGUN TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 2, 1990, p. 10-19. In Russian. 1990 10 p In RUSSIAN refs
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The paper reports the results of an experimental study of the background noise in the test section of a wind tunnel with perforated walls. The principal sources of the noise at transonic flow velocities are identified. Some methods for reducing the level of the background noise are discussed, and their efficiency evaluated. V.L.

A92-30205
INVESTIGATION OF THE EFFECT OF AN ULTRASONIC ACOUSTIC FIELD ON BOUNDARY LAYER SEPARATION ON AN AIRFOIL [ISSLEDOVANIE VLIIANIIA UL'TRAZVUKOVOGO AKUSTICHESKOGO POLIA NA OTRYV POGRANICHNOGO SLOIA NA PROFILE]
S. V. ZHIGULEV and A. V. FEDOROV TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 21, no. 6, 1990, p. 58-66. In Russian. 1990 9 p In RUSSIAN refs
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The paper presents results of theoretical and experimental studies on the effects of an ultrasonic field in the 40-70 kHz range on laminar flow separation in the vicinity of the leading edge of a supercritical wing profile at angles of attack of 7.3-7.7 deg. The experiment was conducted in a low-noise subsonic wind tunnel at flow velocities of 33-71 m/s, corresponding to Reynolds numbers of 0.9 x 10 exp 6 to 1.9 x 10 exp 6. In the absence of the acoustic field a global separation occurs which occupies 20 percent of the airfoil chord. When an acoustic field is applied, the dimensions of the separation zone change substantially, and, when the ultrasonic-field intensity exceeds a certain threshold value, global separation is eliminated altogether, so that the thickness of the shear layer changes by an order of magnitude. This effect has a marked hysteretic and resonant character. L.M.

A92-30318
ACOUSTIC EMISSION DURING CHANGES IN THE AERODYNAMIC LOAD ON THE SURFACE OF A FAN BLADE [AKUSTICHESKOE IZLUCHENIE PRI IMPUL'SNOM IZMENENII AERODINAMICHESKOI NAGRUZKI NA POVERKHNOSTI LOPASTI VENTILIATORA]
S. G. CHUKHLANTSEV (AN SSSR, Akusticheskii Institut, Moscow, USSR) Akusticheskii Zhurnal (ISSN 0320-7919), vol. 37, Sept.-Oct. 1991, p. 1019-1025. In Russian. Oct. 1991 7 p In RUSSIAN refs
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The directional characteristics and acoustic parameters of a source resulting from the aerodynamic interaction between a fan blade and a bluff body located at the exit of the air flow are investigated analytically and experimentally. The results of the study suggest that the theoretical relations obtained for other cases of fan rotation in the field of inhomogeneous flow remain valid for the case considered here. It is shown, in particular, that by changing the number of blades and obstacle location, it is possible to reduce the radiation in the axial direction since most of the radiation in this direction is generated by a force harmonic with a number equal to the number of blades. V.L.

A92-30405
GENERATION OF NEW HARMONICS OF NONLINEAR ELASTIC WAVES IN A COMPOSITE MATERIAL [GENERATSIIA NOVIKH GARMONIK NELINIINIKH PRUZHNIKH KHVIL' V KOMPOZITNOMU MATERIALI]
IA. IA. RUSHCHITS'KII and I. A. OSTRAKOV (AN Ukrainy, Institut Mekhaniki, Kiev, Ukraine) Akademiia Nauk Ukrains'koi RSR, Dopovidi, Matematika, Prirodoznavstvo, Tekhnichni Nauki (ISSN 0868-8052), Oct. 1991, p. 63-66. In Ukrainian. Oct. 1991 4 p In UKRAINIAN refs
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A solution is presented for the problem of the generation of new harmonics during the passage of a nonlinearly elastic wave through a composite material. The solution allows for the self-interaction of modes and for mode-to-mode interaction. Details of the solution procedure are given. V.L.

A92-33708
THERMODYNAMIC INSTABILITY OF THE FREQUENCY OF BULK ACOUSTIC VIBRATIONS OF A QUARTZ PIEZOELECTRIC PLATE [TERMODINAMICHESKAIA NESTABIL'NOST' CHASTOTY OB'EMNYKH AKUSTICHESKIKH KOLEBANII KVARTSEVOI P'EZOPLASTINY]
IU. I. EVDOKIMENKO and IU. S. SHMALII (Khar'kovskoe Vysshee Voennoe Aviatsionnoe Uchilishche Radioelektroniki, Kharkov, Ukraine) Akusticheskii Zhurnal (ISSN 0320-7919), vol. 38, Mar.-Apr. 1992, p. 283-289. In Russian. Apr. 1992 7 p In RUSSIAN refs
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The frequency instability of the bulk acoustic shear vibrations of quartz piezoelectric plates used in high-precision and reference frequency sources depends to a large degree on the rate of ambient temperature change. Here, a generalized operator is obtained for the conversion of the radial component of the temperature field gradient of a quartz piezoelectric plate to its resonance frequency instability. The physical mechanism of the effect of the temperature change rate on the frequency instability of the quartz plate is examined. V.L.

A92-33769
NONLINEAR EFFECTS DURING THE INTERACTION OF ACOUSTIC WAVES WITH PLASMA [NELINEINYE EFFEKTY PRI VZAIMODEISTVII AKUSTICHESKIKH VOLN S PLAZMOI]
G. A. GALECHIAN, E. G. DIVANIAN, and A. R. MKRTCHIAN (AN Armenii, Institut Prikladnykh Problem Fiziki, Yerevan, Armenia) Akusticheskii Zhurnal (ISSN 0320-7919), vol. 38, Jan.-Feb. 1992, p. 19-24. In Russian. Feb. 1992 6 p In RUSSIAN refs
Copyright
Results of an experimental study of the interaction between acoustic waves and a glow discharge plasma are reported. The limits of the generation of acoustic sum and difference signals are determined as a function of the discharge current and gas pressure in the discharge tube. It is found that the generation of acoustic signals with a difference frequency is more intensive than the generation of waves with a sum frequency. It is also shown that second and third harmonics of the fundamental frequency are generated during acoustic wave excitation in a glow discharge. V.L.

A92-33770
POWER SPECTRUM OF RING MODES OF PRESSURE FLUCTUATIONS AT THE SURFACE OF A CYLINDER IN AXIAL FLOW [SPEKTR MOSHCHNOSTI KOL'TSEVYKH MOD PUL'SATSII DAVLENIIA NA POVERKHNOSTI PRODOL'NO OBTEKAEMOGO TSILINDRA]
V. I. ZARKHIN, D. G. ROBIKOV, and V. M. TKACHENKO (Tsentral'nyi NII imeni A. N. Krylova, St. Petersburg, Russia) Akusticheskii Zhurnal (ISSN 0320-7919), vol. 38, Jan.-Feb. 1992, p. 46-51. In Russian. Feb. 1992 6 p In RUSSIAN refs
Copyright
Results of turbulent surface pressure fluctuations are presented for an extended rigid cylinder in axial flow at small angles of attack (from -8 to 8 deg). The measurements have been made using point and circular pressure transducers. Quantitative relations between spectral components of the ring modes and a regular power spectrum are obtained, as are data on the effect of the angle of attack. V.L.

A92-33771
AN EXPERIMENTAL STUDY OF THE NOISE OF FLOW PAST A WING AT LOW VELOCITIES [EKSPERIMENTAL'NOE ISSLEDOVANIE SHUMA OBTEKANIIA KRYLA PRI MALYKH SKOROSTIAKH POTOKA]
A. G. MUNIN, A. G. PROZOROV, and A. V. TOPOROV (Tsentral'nyi Aerogidrodinamicheskii Institut, Zhukovski, Russia) Akusticheskii Zhurnal (ISSN 0320-7919), vol. 38, Jan.-Feb. 1992, p. 108-113. In Russian. Feb. 1992 6 p In RUSSIAN refs
Copyright
The effect of the incoming flow velocity and turbulence on the spectrum and radiation pattern of wing noise is investigated experimentally. It is found that the incoming flow spectrum has only a slight effect on the continuous component of the wing noise spectrum. Various methods of modifying the tonal noise components and their characteristics are discussed. V.L.

A92-45918
SOUND SCATTERING BY LIMITED ELASTIC SHELLS
VADIM V. MUZYCHENKO and SAMUIL A. RYBAK (Russian Academy of Sciences, Acoustical Institute, Moscow, Russia) IN: International Congress on Recent Developments in Air- and Structure-Borne Sound and Vibration, Auburn, AL, Mar. 6-8, 1990, Proceedings. Vol. 2 1990 6 p refs
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The ratio of energy flux to the square of the energy can be used to determine the sound scattering of a finite cylindrical area's radiation impedance. The expression thus obtained approximates the known expression of radiation impedance for an infinite cylindrical area as shell length increases. Scattering amplitude is obtained by means of the radiation impedance. The analysis of this expression allows the primary spatial and temporal resonances to be derived. The present method is applicable to the design of scatterers with prescribed directivity pattern characteristics. O.C.

A92-46521
MATHEMATICAL MODEL OF THE ACOUSTIC FLUTTER OF SUPERSONIC CASCADES [MATEMATICHESKAIA MODEL' AKUSTICHESKOGO FLATTERA SVERKHZVUKOVYKH RESHETOK]
A. V. GUBAREV and S. A. LAPTEV PMTF - Prikladnaia Mekhanika i Tekhnicheskaia Fizika (ISSN 0044-4626), no. 2, Mar.-Apr. 1992, p. 68-72. In Russian. Apr. 1992 5 p In RUSSIAN refs
Copyright
An improved mathematical model of acoustic flutter is developed. More precise boundary conditions for the acoustic problem are obtained and, in contrast to the studies of Gubarev et al. (1989, 1990), consideration is given to the effect produced by longitudinal acoustic waves on the blade motion itself (in the transverse direction). In other words, feedback is introduced into a system which comprises a blade (the mechanical component) and acoustic oscillations of the gas (the acoustic component). This model makes it possible to determine the increment of the self-excitation of self-oscillations. B.J.

N92-15685# Academy of Sciences (USSR), Novosibirsk. Inst. Yadernoj Fiziki.
LARGE AMPLITUDE ION-ACOUSTIC WAVES. STOCHASTIC PHENOMENA, 1
N. S. BUCHELNIKOVA and E. P. MATOCHKIN 1990 70 p In RUSSIAN; ENGLISH summary
(DE91-636671; IYAF-90-7) Avail: CASI HC A04/MF A01
Numerical experiments (OUC-method) were carried out to study the stochastic instability of the electron motion in the course of the evolution of one-dimensional nonlinear ion-acoustic waves. The initial parameters of the ion-acoustic waves correspond to the cases of the linear, nonlinear, strongly nonlinear with ion trapping, and breaking waves. It is shown that the evolution of the nonlinear

ion-acoustic wave is accompanied by the development of the stochastic instability of the electron motion. The growth rate of the instability increases with increasing nonlinearity of the wave. The evolution of the stochastic instability and the formation of the stochastic layer is studied. It is shown that the stochastic layer includes all the initial trapping region of the electrons in the ion-acoustic wave and a part of the phase space outside of it.
DOE

72

ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.

A92-25243
ELECTROOPTICAL PARAMETERS OF MOLECULES - POLARIZABILITIES OF CHEMICAL BONDS [ELEKTROOPTICHESKIE PARAMETRY MOLEKUL - POLIARIZUEMOSTI KHIMICHESKIKH SVIAZEI]
O. G. BOKOV (Saratovskii Sel'skokhoziaistvennyi Institut, Saratov, Russia) and N. K. SIDOROV (Saratovskii Gosudarstvennyi Universitet, Saratov, Russia) Optika Atmosfery (ISSN 0235-277X), vol. 4, July 1991, p. 730-744. In Russian. Jul. 1991 15 p In RUSSIAN refs
Copyright
A review of methods for solving the inverse electrooptical problem of molecular optics is presented. The nature of the ambiguity in the semiempirical determination of the main values of the molecular polarizability tensor are analyzed and the necessity of solving the inverse problem based on the use of the valence-optical theory is shown. On the basis of the invariant expression for molecular polarizability anisotropy, invariant equations are derived for calculating electrooptical parameters (EOP), the i.e., polarizabilities of the chemical bonds of two- to six-atom molecules. EOPs of 25 molecules occurring in the atmosphere as its main components or pollutants are calculated.
P.D.

N92-16746# Academy of Sciences (USSR), Novosibirsk. Inst. Yadernoj Fiziki.
LARGE AMPLITUDE ION-ACOUSTIC WAVES. 2: STOCHASTIC EFFECTS
N. S. BUCHELNIKOVA and E. P. MATOCHKIN 1990 34 p In RUSSIAN; ENGLISH summary
(DE91-643136; IYAF-90-11) Avail: CASI HC A03/MF A01
The numerical experiments (PIC-method) were made to study the stochastic instability of the ion motion in the course of the evolution of one-dimensional nonlinear ion-acoustic wave. It is shown that the evolution of the nonlinear ion-acoustic wave is accompanied by the development of the stochastic instability of the ion motion and by the formation of the stochastic layer. The initial stage of the stochastic instability is studied. It is shown that the stochastic layer includes all the initial trapping region of the ions in the ion-acoustic wave.
DOE

N92-30404# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Ehnergij.
SEARCH FOR LIGHT NEUTRAL SCALAR AND PSEUDOSCALAR PARTICLES IN PFE INTERACTIONS AT 70 GEV [POISK LEGKIKH NEJTRAL'NYKH SKALYARNYKH I PSEVDOSKALYARNYKH CHASTITS V PFE-VZAIMODEJSTVIVAKH PRI EHNERGII 70 GEHV]
V. B. ANIKEEV, N. S. BAMBUROV, and N. I. BOZHKO 1991 25 p In RUSSIAN Submitted for publication
(DE92-627317; IFVE-ONF-91-139) Avail: CASI HC A03/MF A01
A search has been performed for weakly interacting neutral light scalar and pseudoscalar particles in a proton beam dump experiment. No positive signal is observed. Limits on the mass and lifetime of these particles are set in the frame of the Standard Model and its minimal supersymmetric extension. The Higgs particle of the SU(2L) x U(1) Standard Model is excluded for masses in the range 1 MeV less than m less than 80 MeV at 95 percent CL. Limits on the Peccei Quinn like axions are also derived.
DOE

N92-70894 Academy of Sciences (USSR), Novosibirsk. Inst. Yadernoj Fiziki.
ELEMENTARY EXCITATIONS OF SOLITONS IN THE SCHROEDINGER NONLINEAR EQUATION [EHLEMENTARNYE VOZBUZHDENIYA SOLITONOV NELINEJNOGO URAVNENIYA SHREDINGERA]
V. M. MALKIN and E. G. SHAPIRO 1990 13 p In RUSSIAN
(DE92-624514; IYAF-90-78) Avail: CASI HC A03/MF A01
Dynamics of nonlinear wave fields, possessing stable localized states (solitons) depends sufficiently on the spectrum of elementary excitations of these solitons. Spectrum of elementary excitations is calculated for solitons of two-dimensional Schroedinger equation with cubic focusing nonlinearity, describing a wide region of physical phenomena and radiation self-focusing in the medium in particular.
DOE

73

NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

N92-14829# Academy of Sciences of the Ukrainian SSR, Kharkov. Inst. Problem Mashinostroeniya.
QUASI-ANALOGUE METHOD FOR DETERMINATION THERMAL CONTACT RESISTANCE [KVAZIANALOGOVYJ METOD OPREDELENIYAMTERMICHESKIKH KONTAKTNYKH SOPROTIVIENIJ]
O. S. TSAKANYAN and N. A. KOSHEVAYA 1989 19 p In RUSSIAN
(DE91-638960; IPMASH-305) Avail: CASI HC A03/MF A01
Method for solution of inverse problem of thermal conductivity using identification of the 4th kind boundary conditions by the method of parametric optimization is suggested. The temperature of the contact surface is approximated by parametric functions and the inverse problem solution is reduced to search for parameters of these functions. The flowsheet of the device for realizing the 4th kind boundary conditions is described. Statement and solution of two-dimensional problem of determining thermal contact resistances between two contacting bodies are presented.
DOE

N92-14830# Academy of Sciences (USSR), Novosibirsk. Inst. Yadernoj Fiziki.
NONLINEAR COHERENT BEAM-BEAM OSCILLATIONS IN THE RIGID BUNCH MODEL
N. DIKANSKY and D. PESTRIKOV 1990 24 p
(DE91-639001; IYAF-90-14) Avail: CASI HC A03/MF A01
Within the framework of the rigid bunch model, coherent oscillations of strong-strong colliding bunches are described by equations which are specific for the weak-strong beam case. In this paper some predictions of the model for properties of nonlinear coherent oscillations as well as for associated limitations of the luminosity are discussed.
DOE

N92-14831# Academy of Sciences (USSR), Novosibirsk. Inst. Yadernoj Fiziki.
DYNAMICAL CHAOS AND BEAM-BEAM MODELS
F. M. IZRAILEV 1990 20 p
(DE91-639002; IYAF-90-16) Avail: CASI HC A03/MF A01
Some aspects of the nonlinear dynamics of beam-beam interaction for simple one-dimensional and two-dimensional models of round and flat beams are discussed. The main attention is

paid to the stochasticity threshold due to the overlapping of nonlinear resonances. The peculiarities of a round beam are investigated in view of using the round beams in storage rings to get high luminosity. DOE

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OPTICS

Includes light phenomena; and optical devices.

A92-10822
A STUDY OF OPTICAL CHARACTERISTICS OF POLYMERIC OPTICAL FIBERS WITH LUMINESCENT ADDITIONS UNDER TRANSVERSE PUMPING [ISSLEDOVANIE OPTICHESKIKH KHARAKTERISTIK POLIMERNYKH VOLOKONNYKH SVETOVODOV S LIUMINESTSENTNYMI DOBAVKAMI PRI BOKOVOI NAKACHKE]
A. I. ZUBKOV, A. B. IVANOVA, M. P. PIKKIN, and V. M. LEVIN (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Sinteticheskogo Volokna, Tver, USSR) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, June 1991, p. 771-773. In Russian. Jun. 1991 3 p In RUSSIAN refs
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Optical characteristics of active polymeric optical fibers (APOF) with a core made of polymethylmetacrylate with naphthalene and POPOP additions are studied experimentally and theoretically. A relationship is found between the luminescence intensity at the APOF output and the APOF length in the excitation zone. It is shown that the shape of a scattering indicatrix at the APOF output depends greatly on the depth of the penetration of the exciting radiation determined by the wavelength. P.D.

A92-10876
NONLINEAR OPTICAL CHARACTERISTICS OF 3-METOXY-4-OXYBENZALDEHYDE CRYSTALS [NELINEINYE OPTICHESKIE KHARAKTERISTIKI KRISTALLOV 3-METOKSI-4-OKSIBENZAL'DEGIDA]
IU. O. IAKOVLEV and V. M. POEZZHALOV (AN SSSR, Institut Radiotekhniki i Elektroniki, Friazino, USSR) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, May 1991, p. 533, 534. In Russian. May 1991 2 p In RUSSIAN refs
Copyright
Results are presented on measurements of all nonzero components of the nonlinear susceptibility tensor and of the refractive index dispersion of pure 3-metoxy-4-oxybenzaldehyde (vanillin) crystals of good optical quality. Results showed that vanillin crystals combine the record-high nonlinear susceptibility with a broad transmission band and a high resistance to laser-induced damage. I.S.

A92-10892
THE CHARACTERISTICS AND APPLICATIONS OF SELF-DIFFRACTION IN LIGHT WAVES WITH NONCOLLINEAR POLARIZATIONS [OSOBENNOSTI I PRIMENENIIA SAMODIFRAKTSII SVETOVYKH VOLN S NEKOLLINEARNYMI POLIARIZATSIIAMI]
N. N. ZHUKOV, O. P. ZASKAL'KO, and I. G. KUZNETSOV (AN SSSR, Institut Obshchei Fiziki, Moscow, USSR) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, May 1991, p. 603-610. In Russian. May 1991 8 p In RUSSIAN refs
Copyright
The paper examines the characteristics of unsteady self-diffraction in two waves with different polarizations in an isotropic medium with scalar response. It is shown that this effect can be used for developing a polarization shutter, which, in addition to switching the signal, can amplify the signal wave. A method is proposed for measuring the degree of temporal coherence of light beams, including those with a well-developed unsteady speckle structure. The validity of the method is experimentally demonstrated. I.S.

A92-10899
RADIATION SCATTERING BY SUPERSMOOTH OPTICAL SURFACES PROCESSED BY THE DIAMOND-CUTTING METHOD. II - EXPERIMENT [RASSEIANIE LAZERNOGO I RENTGENOVSKOGO IZLUCHENIIA SVERKHGLADKIMI POVERKHNOSTIAMI, OBRABOTANNYMI METODOM ALMAZNOGO TOCHENIIA. II - EKSPERIMENT]
S. S. BORISOVA, V. S. GOROKHOV, N. N. ZOREV, G. V. MARININ, I. F. MIKHAILOV, V. N. MOROZOV, P. V. MIASNIKOV, and S. E. SOLODOV (AN SSSR, Fizicheskii Institut, Moscow, USSR) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, May 1991, p. 643-647. In Russian. May 1991 5 p In RUSSIAN refs
Copyright
A procedure was developed for determining the quality of supersmooth surfaces of laser mirrors processed by a diamond-cutting method, from measurements of the amount of scattering produced by laser- and X-ray radiation. The analysis of the experimentally obtained scattering diagrams made it possible to identify not only the basic harmonic component of the microrelief but also a number of additional long-wavelength harmonics that are not its multiples. The effect of the relief curvature on the shape of the scattering function was demonstrated, and the criteria making the relief curvature suitable for quantitative processing of scattering data are formulated. The results are validated by correlations with surface data obtained from diagrams of laser and X-ray scattering at different angles of incidence. The method can be used for estimating the quality of optical surfaces coated by various reflective or transmitting materials. I.S.

A92-13043
OPTIMISATION THRESHOLD PARAMETERS OF MULTIPLE QUANTUM WELL INFRA-RED PHOTODETECTOR
F. SERZHENKO and V. SHADRIN (Moskovskii Fiziko-Tekhnicheskii Institut, Moscow, USSR) IEE Proceedings, Part J - Optoelectronics (ISSN 0267-3932), vol. 138, no. 5, Oct. 1991, p. 299, 300. Oct. 1991 2 p refs
Copyright
The multiple-quantum-well photodetector is evaluated theoretically in terms of background-limited IR detection with attention given to the effects of depolarization. By varying doping concentration, boundary wavelength, and the number of wells, the optimal values for detectivity are determined for the specific type of IR detection. The detectivity nonmonotonically depends on the concentration of electrons in the wells which result from depolarization effects. Maximum detectivity is therefore related to an optimum value for the amount of impurities introduced as a doping agent. The detectivities are illustrated by comparing multiple-quantum-well GaAs/AlGaAs photodetectors with different boundary long wavelengths, and optimal values for the variables are given for the corresponding photodetectors. C.C.S.

A92-16752
EXPERIMENTAL INVESTIGATION OF AN ACTIVE OPEN OPTICAL RESONATOR IN THE TURBULENT ATMOSPHERE [EKSPERIMENTAL'NOE ISSLEDOVANIE AKTIVNOGO OTKRYTOGO OPTICHESKOGO REZONATORA V TURBULENTNOI ATMOSFERE]
S. S. MIKHAILOVSKII, P. M. GUSAK, and L. S. NENOV (Odesskii Gidrometeorologicheskii Institut, Odessa, Ukrainian SSR) Radiofizika (ISSN 0021-3462), vol. 34, Feb. 1991, p. 111-118. In Russian. Feb. 1991 8 p In RUSSIAN refs
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The spectral densities (SD) of time fluctuations of the amplitude of steady-state generation at two wavelengths, 0.63 and 1.15 micron, under turbulent fluctuations of the refraction index in the waveguide channel of an open optical resonator are investigated. The SD frequency dependences at different states of atmospheric turbulence, including that generated in a wind tunnel, are analyzed.

The asymptotic behavior of the frequency dependences is analyzed from the standpoint of the self-similarity of the stochastic characteristics of the waveguide channel-medium system. P.D.

A92-18178
REFLECTED-SECOND-HARMONIC GENERATION AND DIELECTRIC-METAL TRANSITION ON CONDUCTING POLYMER FILMS [GENERATSIIA OTRAZHENNOI VTOROI GARMONIKI I PEREKHOD DIELEKTRIK-METALL V PROVODIASHCHIKH POLIMERNYKH PLENKAKH]
O. A. AKTSIPETROV (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR), V. V. VERETA, L. I. DAIKHIN, M. D. LEVI (AN SSSR, Institut Elektrokhimii, Moscow, USSR), A. V. ERMUSHEV (Troitskii Innovatsionnyi Nauchno-Issledovatel'skii Tekhnologicheskii Institut, Troitsk, USSR), and A. V. PETUKHOV (AN SSSR, Institut Kristallografii, Moscow, USSR) Pis'ma v Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki (ISSN 0370-274X), vol. 54, Aug. 10, 1991, p. 175-178. In Russian. 10 Aug. 1991 4 p In RUSSIAN refs
Copyright
The observation of second harmonic generation during light reflection from conducting polymer films is reported. The nonlinear-optical properties of a polyaniline film are shown to change significantly in the vicinity of the dielectric-metal transition, which may be associated with a nonlinear-optical electrochromism effect or with a change in the film symmetry. L.M.

A92-23494
THE THERMAL SELF-DEFOCUSING FACTOR OF A MULTIFREQUENCY OPTICAL BEAM [FAKTOR TEPLOVOGO SAMOVOZDEISTVIIA MNOGOCHASTOTNOGO OPTICHESKOGO PUCHKA]
A. N. KUCHEROV, N. K. MAKASHEV, and E. V. USTINOV Radiofizika (ISSN 0021-3462), vol. 34, May 1991, p. 528-535. In Russian. May 1991 8 p In RUSSIAN refs
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The effect is investigated of the thermal self-defocusing of an optical multifrequency beam in a transverse flow of weakly absorbing gas within the framework of geometric and paraxial wave optics. A linearized solution obtained within the confines of geometric optics is used to derive a thermal self-defocusing factor (function of the extent of the path and the similarity parameter) which determines the main characteristics of the effect under consideration for the case of collimated and focused beams. The proof is elaborated using numerical calculations within the framework of paraxial wave optics for stationary subsonic and supersonic gasdynamic self-defocusing regimes. P.D.

A92-23536
DEPENDENCE OF THE EFFICIENCY OF THE CORRECTION OF A THERMAL LENS ON THE BASIS OF CONTROL COORDINATES [ZAVISIMOST' EFFEKTIVNOSTI KORREKTSII TEPLOVOI LINZY OT BAZISA KOORDINAT UPRAVLENIIA]
F. IU. KANEV and S. S. CHESNOKOV (AN SSSR, Institut Optiki Atmosfery, Tomsk, USSR) Optika Atmosfery (ISSN 0235-277X), vol. 4, Sept. 1991, p. 983-986. In Russian. Sep. 1991 4 p In RUSSIAN refs
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A mathematical simulation of compensation for laser beam thermal blooming is considered. The optimal control basis of a mirror designed to compensate for thermal self-defocusing is determined. The dependence of the phase correction efficiency on the number of wave front aberrations reproduced by the corrector is determined. The investigation is performed for a wide range of medium and field parameters. P.D.

A92-23643
FREQUENCY CHARACTERISTICS OF STANDING-WAVE ACOUSTOOPTIC MODULATORS [CHASTOTNYE KHARAKTERISTIKI AKUSTOOPTICHESKIKH MODULIATOROV NA STOIACHEI VOLNE]
A. A. APOLONSKII and S. D. SHCHEBETOV Avtometriia (ISSN 0320-7102), Sept.-Oct. 1991, p. 34-38. In Russian. Oct. 1991 5 p In RUSSIAN refs
Copyright
Experimental data are presented on the performance of wide-aperture standing-wave acoustooptic modulators used as laser mode lockers. In particular, attention is given to the acoustooptic and electrical frequency characteristics of the modulators. The existence of a large effective diffraction frequency region below the fundamental frequency is demonstrated. Individual frequency regions of effective diffraction do not correspond to the even and odd harmonics. V.L.

A92-25246
OPTIMIZATION AND EFFICIENCY OF RADIATION CONTROL IN ADAPTIVE OPTICAL SYSTEMS WITH FLEXIBLE MIRRORS [OPTIMIZATSIIA I EFFEKTIVNOST' UPRAVLENIIA IZLUCHENIEM ADAPTIVNYKH OPTICHESKIKH SISTEM S GIBKIM ZERKALOM]
V. E. KIRAKOSIANTS, V. A. LOGINOV, V. V. SLONOV, A. O. SULIMOV, and V. N. TIMOFEEV (NPO Astrofizika, Moscow, Russia) Optika Atmosfery (ISSN 0235-277X), vol. 4, July 1991, p. 770-778. In Russian. Jul. 1991 9 p In RUSSIAN refs
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Attention is given to an adaptive optical system (AOS) of radiation focusing which consists of a wavefront analyzer in the form of Hartman matrix sensors and a corrector which is a controlled flexible mirror. Assuming a complete statistical description of the received radiation, the synthesis of an optimal algorithm to control the radiation in the AOS aimed at compensating for the distortions due to atmospheric turbulence is performed. The efficiency of the algorithm proposed is investigated as a function of the basic parameters of the adaptive system and of the external medium's state. P.D.

A92-30267
HOLOGRAPHIC RECORDING IN PHOTOPOLYMER MATERIALS [GOLOGRAFICHESKAIA ZAPIS' NA FOTOPOLIMERNYKH MATERIALAKH]
E. A. TIKHONOV, E. S. GIUL'NAZAROV, and T. N. SMIRNOVA (AN Ukrainy, Institut Fiziki, Kiev, Ukraine) Kvantovaia Elektronika (ISSN 0368-7155), no. 40, 1991, p. 1-25. In Russian. 1991 25 p In RUSSIAN refs
Copyright
Results of the development and a photopolymer medium for the recording of three-dimensional phase holograms are reported. The approach used here is based on the principle of the radical polymerization of monomer-oligomer compositions while being exposed to the object and reference waves in the absorption band of the initiator. The problem of the long-term photochemical stability of the recorded holograms is solved by adding a diffuser to the photopolymer composition, with the concentration of the diffuser varying in the different phase fields of the hologram. V.L.

A92-30270
EFFECT OF RELATIVISTIC ELECTRONS ON OPTICAL COATINGS OF THE TYPE GE-AS-SE [DEISTVIE RELIATIVISTSKIKH ELEKTRONOV NA OPTICHESKIE POKRYTIIA TIPA GE-AS-SE]
N. I. DOVGOSHEI, L. G. KESLER, and N. D. SAVCHENKO (Uzhgorodskii Gosudarstvennyi Universitet, Uzhgorod, Ukraine) Kvantovaia Elektronika (ISSN 0368-7155), no. 40, 1991, p. 43-49. In Russian. 1991 7 p In RUSSIAN refs
Copyright
The effect of electron irradiation on the composition, structure, and optical and mechanical properties of Ge-As-Se glasses was investigated experimentally. Based on the experimental results and theoretical calculations, the possibility of producing radiation-resistant optical coatings based on Ge-As-Se glasses capable of withstanding electron fluxes up to 10 exp 17 electrons/sq cm is demonstrated. V.L.

A92-33509
IS THE PHASE-ONLY FILTER AND ITS MODIFICATIONS OPTIMAL IN TERMS OF THE DISCRIMINATION CAPABILITY IN PATTERN RECOGNITION?
L. P. IAROSLAVSKII (Rossiiskaia Akademiia Nauk, Institut Problem Peredachi Informatsii, Moscow, Russia) Applied Optics (ISSN 0003-6935), vol. 31, April 10, 1992, p. 1677-1679. 10 Apr. 1992 3 p refs
(Contract DFG-ER-16/94-1)
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The problem of filter optimality in terms of the discrimination capability is addressed. A comparison of several recently proposed filters shows that filters for pattern recognition approximate more or less the optimal filter, which is not so easy to implement.
O.G.

A92-35501
OPTICAL MATERIALS FOR INFORMATION OPTICS
IGOR' V. MOCHALOV and GURII T. PETROVSKII (State Optical Institute, St. Petersburg, Russia) Optical Engineering (ISSN 0091-3286), vol. 31, no. 4, April 1991, p. 658-663. Apr. 1991 6 p refs
Copyright
The state of the art in materials for information optics is reviewed. Methods of studying the properties of these materials are addressed, and the processes that determine optical breakdown are considered.
C.D.

A92-41488
UV LASER EXCITATION-INDUCED DEFECTS IN SILICA GLASS DOPED WITH GERMANIUM AND CERIUM
E. V. ANOIKIN, E. M. DIANOV, V. M. MASHINSKII, V. B. NEUSTRUEV (Russian Academy of Sciences, General Physics Institute, Moscow, Russia), A. N. GURIANOV, D. D. GUSOVSKII, S. I. MIROSHNICHENKO (Russian Academy of Sciences, Institute for Chemistry of High-Purity Substances, Nizhni Novgorod, Russia), V. A. TIKHOMIROV (Moscow State University, Russia), and IU. B. ZVEREV (Nizhni Novgorod State University, Russia) IN: Lasers '90; Proceedings of the 13th International Conference on Lasers and Applications, San Diego, CA, Dec. 10-14, 1990 1991 8 p refs
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The paramagnetic defects and optical absorption bands induced by UV irradiation in the germanosilicate core of the MCVD optical fiber preform with and without Ce addition have been investigated. The selective laser ionization of Ce(3+) ions has been carried out to determine the signs of the Ge-related color centers. The paramagnetic Ge(1,2) and Ge E-' centers are formed in pure SiO2-GeO2 glass but the Ge(2)-center was not observed in Ce-doped glass. These results show Ge(1) and Ge E' centers to be formed by trapping an electron and Ge(2) to be a hole center. Photobleaching of the gamma-induced Ge(1,2)-centers and optical absorption by the nitrogen laser radiation (photon energy E = 3.68 eV) has also been observed.
Author

A92-42707
OPTIMIZING INTERFERENCE COATINGS IN ADAPTIVE RADIOOPTIC DEVICES [OPTIMIZIRUIUSHCHIE INTERFERENTSIONNYE POKRYTIIA V USTROISTVAKH ADAPTIVNOI RADIOOPTIKI]
I. N. SISAKIAN, A. V. TIKHONRAVOV, A. B. SHVARTSBURG, A. V. SHEPELEV, and V. G. IAKUSHKINA (Moskovskii Gosudarstvennyi Universitet, Moscow, Russia) Moskovskii Universitet, Vestnik, Seriia 3 - Fizika, Astronomiia (ISSN 0579-9392), vol. 33, no. 1, Jan.-Feb. 1992, p. 72-77. In Russian. Feb. 1992 6 p In RUSSIAN refs
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Optimizing coatings are calculated in quantitative terms through an analysis of the field dependences of the optical properties of semiconductor materials in the FIR range. The amplitude-phase characteristics of adaptive radiooptic devices are calculated, and it is shown that optimizing interference coatings make it possible to significantly (by a factor of 3-4) broaden the dynamic range of amplitude-modulation devices.
V.L.

A92-44468
RAPID MODULATION OF INTERBAND OPTICAL PROPERTIES OF QUANTUM WELLS BY INTERSUBBAND ABSORPTION
VERA B. GORFINKEL' (Rossiiskaia Akademiia Nauk, Institut Radiotekhniki i Elektroniki, Saratov, Russia) and SERGE LURYI (AT&T Bell Laboratories, Murray Hill, NJ) Applied Physics Letters (ISSN 0003-6951), vol. 60, no. 25, June 22, 1992, p. 3141-3143. 22 Jun. 1992 3 p refs
Copyright
Intersubband absorption of radiation by a 2D electron gas can be used to control the electron temperature and effect a significant modulation of the interband optical properties of the semiconductor in the quantum well. The implementation of a fast modulator of infrared radiation for fiber-optical communications and the formation of powerful and short single-mode infrared pulses are discussed.
Author

N92-19562 Academy of Sciences of the Ukrainian SSR, Kiev. Inst. of Physics.
METHODOLOGICAL ISSUES OF OPTICAL SPECTRA STUDIES [METODOLOGICHESKIE OSOBENNOSTI IZUCHENIIA OPTICHESKIKH SPEKTROV]
B. M. NITSOVICH and V. D. FALENCHUK 1989 41 p In RUSSIAN
Copyright Avail: Issuing Activity
In this work a study is conducted of the optical properties of three-component systems: the exciton-photon-phonon. Various theoretical approaches to the study of the exciton spectrum are investigated, including the Green's functions method, the method of inverse spectra problems, and the method of moments. The temperature dependences of the spectral characteristics of an exciton are analyzed.
Transl. by L.K.H.

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

A92-15010
AERODYNAMIC CHARACTERISTICS OF POSITIVELY CHARGED BODIES MOVING IN A STRONGLY RAREFIED PLASMA [AERODINAMICHESKIE KHARAKTERISTIKI POLOZHITEL'NO ZARIAZHENNYKH TEL, DVIZHUSHCHIKHSIA V SIL'NO RAZREZHENNOI PLAZME]
IU. F. GUN'KO (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR) IN: Dynamic processes in gases and solid bodies 1990 9 p In RUSSIAN refs
Copyright
A method for calculating the aerodynamic characteristics of bodies moving in a rarefied plasma, originally developed for the case of negative surface potentials with respect to the surrounding plasma, is extended to the case of positive potentials. Expressions are presented which describe local stresses on the surface in the approximation of a plane double layer in the case of hypersonic velocities.
V.L.

A92-16694
EXCITATION OF ALFVEN WAVES BY A MODULATED ION BEAM IN THE IONOSPHERE OR MAGNETOSPHERE [VOZBUZHDENIE AL'VENOVSKIKH VOLN MODULIROVANNYM IONNYM PUCHKOM V IONOSFERE ILI MAGNITOSFERE]
K. R. SIMOVSKII Radiotekhnika i Elektronika (ISSN 0033-8494), vol. 36, Nov. 1991, p. 2156-2161. In Russian. Nov. 1991 6 p In RUSSIAN refs
Copyright
The possible generation of intense coherent radiation at the

modulation frequency of an ion beam injected at a large pitch angle into the near-earth plasma and density-modulated on the injector is analyzed. Beams of heavy ions are shown to be the most suitable for the Alfven-wave generation. At a starting injector energy of 5-10 MJ it appears to be possible to achieve a conversion of 10-100 kJ of energy into Alfven-wave energy using heavy-ion beams injected at a large pitch angle. L.M.

A92-16857
INTERACTION OF LASER-PLASMA CLUSTERS [VZAIMODEISTVIE SGUSTKOV LAZERNOI PLAZMY]
U. SH. BEGIMKULOV, B. A. BRIUNETKIN, V. M. DIAKIN, G. A. KOLDASHOV, A. IU. REPIN, E. L. STUPITSKII, and A. IA. FAENOV (NPO Vsesoiuznyi NII Fiziko-Tekhnicheskikh i Radiotekhnicheskikh Izmerenii, Moscow, USSR) Kvantovaia Elektronika (Moscow) (ISSN 0368-7147), vol. 18, July 1991, p. 877-881. In Russian. Jul. 1991 5 p In RUSSIAN refs
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The interaction of two clusters of plasma during their expansion into a vacuum is investigated. The spatial structure of luminosity in BeI-BeIII lines from two interacting laser plasma clusters is determined, and observational results of ion luminosity localization of ions with different ionization multiplicity are presented. A mathematical model of the process which makes it possible to obtain ionization and optical characteristics of interacting clusters is discussed. The spatial pattern of the plasma-charge composition in the interaction area is plotted. Calculated and experimental emission coefficients for some lines of BeII and BeIII are compared. P.D.

A92-21541
NONLINEAR DYNAMICS OF THE DISSIPATIVE FILAMENTARY INSTABILITY OF AN ELECTRON FLUX IN A MAGNETOACTIVE PLASMA [NELINEINAIA DINAMIKA DISSIPATIVNOI FILAMENTATSIONNOI NEUSTOICHIVOSTI ELEKTRONNOGO POTOKA V MAGNITOAKTIVNOI PLAZME]
V. P. PAS'KO (Kievskii Gosudarstvennyi Universitet, Kiev, Ukraine) Pis'ma v Zhurnal Tekhnicheskoi Fiziki (ISSN 0320-0116), vol. 17, Oct. 26, 1991, p. 13-17. In Russian. 26 Oct. 1991 5 p In RUSSIAN refs
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The nonlinear dynamics of the filamentary instability of an electron flux drifting in plasma in the presence of a magnetic field and collisison in both the plasma and the flux is investigated analytically. Particular attention is given to the case of a weak flux in a strong magnetic field, where the instability increment is determined by collisions of the flux electrons with the plasma-neutral background. The analysis is based on the nonradiative method of filamentary instability modeling. V.L.

A92-21616
STABILITY OF A SYSTEM OF TWO IMMISCIBLE FLUIDS IN MAGNETOHYDRODYNAMICS [USOICHIVOST' SISTEMY DVUKH NESMESHIVAIUSHCHIKHSIA ZHIDKOSTEI V MAGNITNOI GIDRODINAMIKE]
M. P. ZEKTSER Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), Nov.-Dec. 1991, p. 88-94. In Russian. Dec. 1991 7 p In RUSSIAN refs
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The stability of a system of two conducting immiscible fluids is investigated with allowance for the induced magnetic field and gravity, with particular reference to the stability of processes in electrolyzers. Calculations are performed for specific values of parameters corresponding to the electrolysis conditions. The parameters of a feedback controller are determined, making it possible to stabilize unstable stationary states using signals from a transducer monitoring the deviation of a parameter from its stationary value. V.L.

A92-22694* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
A COMPARISON AND REVIEW OF STEADY-STATE AND TIME-VARYING RECONNECTION
V. S. SEMENOV, I. V. KUBYSHKIN, V. V. LEBEDEVA (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR), R. P. RIJNBEEK (St. Andrews, University, Scotland), M. F. HEYN, H. K. BIERNAT (Oesterreichische Akademie der Wissenschaften, Institut fuer Weltraumforschung, Graz, Austria), and C. J. FARRUGIA (NASA, Goddard Space Flight Center, Greenbelt, MD) Planetary and Space Science (ISSN 0032-0633), vol. 40, Jan. 1992, p. 63-87. Jan. 1992 25 p refs
(Contract FFWF PROJECT P-8046-GEO)
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Extensions of Petschek's (1964) analysis are reviewed and used to investigate the steady-state and time-dependent reconnection in a current sheet geometry of the type observed at the magnetopause. It is shown that steady-state reconnection appears as a very special case in a time-dependent analysis. A single theoretical framework is proposed for interpreting reconnection phenomena at the magnetopause and for investigating the characteristics of dayside reconnection. I.S.

A92-23596
EFFECT OF NONIDEALITY ON THE COMPOSITION AND OPTICAL PROPERTIES OF A NONEQUILIBRIUM PLASMA BEHIND THE FRONT OF STRONG SHOCK WAVES IN AR [VLIIANIE NEIDEAL'NOSTI NA SOSTAV I OPTICHESKIE SVOISTVA NERAVNOVESNOI PLAZMY ZA FRONTOM SIL'NYKH UDARNYKH VOLN V AR]
E. A. FILIMONOVA (AN SSSR, Institut Vysokikh Temperatur, Moscow, USSR) Fizika Plazmy (ISSN 0367-2921), vol. 17, Dec. 1991, p. 1440-1445. In Russian. Dec. 1991 6 p In RUSSIAN refs
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The composition and optical characteristics of a plasma in the nonequilibrium region behind the front of strong shock waves in Ar are calculated for velocities of 10-25 km/s and pressures of 300-760 torr. The nonideality of the multiple-charge plasma is considered in the circular approximation of the Debye theory in a large canonical ensemble. The composition of the two-temperature plasma is determined from the solution of the kinetic equations electron energy balance. The relationship between the relaxation zone and the shock wave velocity is obtained. V.L.

A92-25994
GENERATION OF STIMULATED EMISSION BY A TRAVELING IONIZATION FRONT DURING BREAKDOWN IN INTERSECTING RADIO WAVE BEAMS [GENERATSIIA STIMULIROVANNOGO IZLUCHENIIA BEGUSHCHIM FRONTOM IONIZATSII PRI PROBOE V PERESEKAIUSHCHIKHSIA PUCHKAKH RADIOVOLN]
N. D. BORISOV and A. V. GUREVICH (IZMIRAN, Troitsk, USSR) Fizika Plazmy (ISSN 0367-2921), vol. 17, Sept. 1991, p. 1131-1137. In Russian. Sep. 1991 7 p In RUSSIAN refs
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The possibility of obtaining atmospheric pressure laser action at the second positive system of nitrogen in the case of pulsed breakdown in intersecting radio wave beams is discussed. The intensity of stimulated emission is calculated, and numerical estimates of the effect are presented. V.L.

A92-30303
NUMERICAL MODELING OF THE STRUCTURE OF AN OBLIQUE COLLISIONLESS SHOCK WAVE WITH ALLOWANCE FOR ELECTRON INERTIA [CHISLENNOE MODELIROVANIE STRUKTURY KOSOI BESSTOLKNOVITEL'NOI UDARNOI VOLNY S UCHETOM INERTSII ELEKTRONOV]
A. A. GALEEV, A. S. LIPATOV, and A. A. MAL'GICHEV (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR) Fizika Plazmy (ISSN 0367-2921), vol. 17, Oct. 1991, p. 1211-1216. In Russian. Oct. 1991 6 p In RUSSIAN refs
Copyright

The fine structure of an oblique shock wave is modeled over a wide range of Mach numbers using a hybrid code. The results of one-dimensional numerical modeling with allowance for electron inertia indicate that a right-side whistler with an amplitude

comparable with the incoming flow field is formed at the base of an oblique collisionless shock wave with a large angle between the magnetic field vector and a normal to the shock front. The dynamics of a magnetic field and protons at a shock front with a standing whistler is analyzed. V.L.

A92-31901
A UNIPOLAR JET GENERATED BY AN ION SOURCE ON A PLATE [UNIPOLIARNAIA STRUIA, SOZDAVAEMAIA IONNYM ISTOCHNIKOM NA PLASTINE]
A. P. KURIACHII TsAGI, Uchenye Zapiski (ISSN 0321-3439), vol. 22, no. 3, 1991, p. 128-131. In Russian. 1991 4 p In RUSSIAN refs
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Electrical characteristics are calculated for a unipolar charged jet formed by an ion source located at the leading edge of a dielectric plate, with flow of an incompressible gas over it. The effect of the model problem parameters on the space charge density near the surface in the path of the flow is determined. The distribution of the space charge along the plate is plotted for different field intensities. V.L.

A92-31989
ELECTRICAL CHARGES DURING THE MOTION OF BODIES AT SUPERSONIC VELOCITIES [ELEKTRICHESKIE ZARIADY PRI DVIZHENII TEL S GIPERZVUKOVYMI SKOROSTIAMI]
IU. L. SEROV and I. P. IAVOR (Rossiiskaia Akademiia Nauk, Fiziko-Tekhnicheskii Institut, St.Petersburg, Russia) Zhurnal Tekhnicheskoi Fiziki (ISSN 0044-4642), vol. 61, Sept. 1991, p. 9-14. In Russian. Sep. 1991 6 p In RUSSIAN refs
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Experimental results are presented on the formation of electrical charges in bodies and their wakes at supersonic velocities in xenon in the case of plasma formation near the body or in its wake. The mechanisms of charge diffusion and gasdynamic separation in flows are examined. It is found that, depending on the body velocity and gas pressure, different regions of the wake may carry charges of varying magnitude and polarity. The existence of a charge precursor moving ahead of the head shock is discovered. V.L.

A92-33701
ANALYSIS OF FLOW OF A THERMALLY NONEQUILIBRIUM ARGON PLASMA IN A PLASMATRON CHANNEL WITH A SUDDEN EXPANSION [RASCHET TECHENIIA TERMICHESKI NERAVNOVESNOI ARGONOVOI PLAZMY V KANALE PLAZMOTRONA S VNEZAPNYM RASSHIRENIEM]
A. S. VOINOVSKII and V. V. NOVOMLINSKII (Moskovskii Aviatsionnyi Institut, Moscow, Russia) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 30, Jan.-Feb. 1992, p. 19-24. In Russian. Feb. 1992 6 p In RUSSIAN refs
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Results of the modeling of subsonic and supersonic flows of a thermally nonequilibrium argon arc plasma in a plasmatron channel and inside an adjacent vacuum chamber are reported. The analysis employs a single-fluid two-temperature model based on a full system of Navier-Stokes equations which allows calculations for regions where the commonly used boundary layer approximation is not applicable. Results of calculations of flow in a plasmatron with axial gas feed and expansion into a vacuum chamber are presented. V.L.

A92-47933
THE DYNAMICS OF THE OBJECT POTENTIAL DURING ELECTRON BEAM INJECTION AND THE POSSIBILITY TO CONTROL IT
V. N. ORAEVSKII, IU. IA. RUZHIN, and V. S. DOKUKIN (IZMIRAN, Troitsk, Russia) Dec. 1992 5 p refs
Copyright
This review of the rocket and satellite experiments on electron beam injection in the height range of the ionosphere-magnetosphere shows a variety of manifestations of the positive charge potential on the body of the injector unit or in the space charge zone. The possibilities of compensation are considered on the basis of theoretical models taking into account the beam-plasma collective interactions. It is shown that changing the pulse form and rise rate can change the structure of the space charge zone. The APEX facilities used to control the inflow current, the spectrum of energetic particles, the high-frequency oscillations, and the spatial distribution of optical emissions in the injector vicinity with high time resolution are considered. Author

A92-51977
THE CRITICAL IONIZATION VELOCITY PHENOMENON IN ASTROPHYSICS AND SOLAR SYSTEM PLASMA PHYSICS
I. KH. KHABIBRAKHMANOV (Rossiiskaia Akademiia Nauk, Institut Kosmicheskikh Issledovanii, Moscow, Russia) (Planetary magnetospheric physics II; Proceedings of Symposium 5 and the Topical Meetings of the Interdisciplinary Scientific Commission B /Meetings B1 and B6/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-51951 22-91) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 8, Aug. 1992, p. 303-312. Aug. 1992 10 p refs
Copyright
An overview of the critical ionization velocity (CIV) phenomenon with respect to astrophysics is presented to examine the limits of its applicability. Alfven's hypothesis regarding the evolution of the solar system is discussed with references to detections of CIV by Voyager 1 and 2 in the Io plasma torus. Theoretical consideration is given to the CIV in general solar-system plasma physics and an analysis is given of the collisionless energy transfer from ions to electrons in the gas ionized by the plasma flow. The review examines the linear theory of plasma-wave excitation by newly ionized atom beams, and treatment is given to the quasilinear relaxation of the ion beam and electron heating. It is shown that wave intensity increases with neutral gas density leading to nonlinear effects that cannot be neglected. This phenomenon is shown to give limits to the applicability of quasilinear theory at which nonlinear effects should be estimated. C.C.S.

N92-13796# Department of Energy, Washington, DC.
WORLD PROGRESS TOWARD FUSION ENERGY
J. F. CLARKE Sep. 1989 20 p Presented at the 14th World Energy Conference, Montreal (Canada), 17-22 Sep. 1989 (DE90-625427; INIS-MF-12547; CONF-890901) Avail: CASI (US Sales Only) HC A03/MF A01
This paper will describe the progress in fusion science and technology from a world perspective. The paper will cover the current technical status, including the understanding of fusion's economic, environmental, and safety characteristics. Fusion experiments are approaching the energy breakeven condition. An energy gain (Q) of 30 percent has been achieved in magnetic confinement experiments. In addition, temperatures required for an ignited plasma (Ti = 32 KeV) and energy confinements (about 75 percent of that required for ignition) have been achieved in separate experiments. Two major facilities have started the experimental campaign to extend these results and achieve or exceed Q = 1 plasma conditions by 1990. Inertial confinement fusion experiments are also approaching thermonuclear conditions and have achieved a compression factor 100-200 times liquid D-T. Because of this progress, the emphasis in fusion research is turning toward questions of engineering feasibility. Leaders of the major fusion R and D programs in the European Community (EC), Japan, the United States, and the U.S.S.R. have agreed on the major steps that are needed to reach the point at which a practical fusion system can be designed. The United States is preparing for an experiment to address the last unexplored scientific issue, the physics of an ignited plasma, during the late 1990's. The EC, Japan, U.S.S.R., and the United States have joined together under the auspices of the International Atomic Energy Agency (IAEA) to jointly design and prepare the validating R&D for an international facility, the International Thermonuclear Experimental Reactor (ITER), to address all the remaining scientific issues and to explore the engineering technology of fusion around the turn of the century. DOE

N92-14847# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. Atomnoj Ehnergii.
SIMULATION OF STEADY CURRENT MAINTAINING IN A TOKAMAK THERMONUCLEAR REACTOR WITH NEUTRAL ATOM BEAM INJECTION
V. M. LEONOV and A. R. POLEVOJ 1990 32 p In RUSSIAN; ENGLISH summary
(DE91-636815; IAE-5013-8) Avail: CASI HC A03/MF A01

The results of numerical simulation of maintaining stationary current using neutral injection in the tokamak fusion reactor are presented. The calculation of the method efficiency and of the necessary rate of injection depending on the plasma parameters and the injection system are presented. Various methods for changing the profile of the generated current are studied. DOE

N92-16862# Academy of Sciences (USSR), Novosibirsk. Inst. Yadernoj Fiziki.
ABSORPTION OF PLASMONS BY A LANGMUIR SOLITON
B. N. BREJZMAN 1990 24 p In RUSSIAN; ENGLISH summary
(DE91-643137; IYAF-90-6) Avail: CASI HC A03/MF A01

As one-dimensional Langmuir collapse is forbidden, one has to search for the alternative mechanisms accounting for the collisionless dissipation of one-dimensional Langmuir waves. A conceivable mechanism is the trapping of free plasmons into solitons, resulting in soliton compression to the size needed for enhanced Landau damping. We show that free plasmons become trapped into solitons by means of their induced scattering on plasma electrons (nonlinear Landau damping). The analytical model developed in this work describes the interaction of a soliton with a gas of free plasmons and demonstrates the possibility of self-accelerating compression of the soliton. DOE

N92-26808# Academy of Sciences of the Ukrainian SSR, Kiev. Inst. Teoreticheskoj Fiziki.
SHORT-WAVE LOW-FREQUENCY SPECTRA IN A CURRENT-CARRYING PLASMA
M. O. VAKULENKO 1991 12 p In RUSSIAN; ENGLISH summary
(DE92-621529; ITF-91-11) Avail: CASI HC A03/MF A01

The finite low frequency, short wave electromagnetic fluctuations in a current carrying plasma, are investigated. The linear stationary electrostatic, cross and magnetostatic spectra are obtained. In strongly nonlinear regime, within the scope of the renormalized statistical approach, the suprathermal stationary electrostatic and effective magnetic potential fluctuations spectra are calculated, together with their renormalized widths and the relevant anomalous electron heat conductivity coefficient. The Kolmogorov spectra are found, also. DOE

N92-70120 Academy of Sciences of the Ukrainian SSR, Kharkov. Fiziko-Tekhnicheskij Inst.
NUMERICAL SIMULATION OF TRANSIENTS IN PLASMA NEAR THE VARIABLE POTENTIAL NEGATIVE CHARGED BODY
N. G. PAVLENKO, YU. P. BLIOKH, V. P. ZEJDLITS, YU. V. TKACH, and I. F. KHARCHENKO 1989 7 p In RUSSIAN
(DE91-624481; KFTI-89-2) Avail: CASI HC A02/MF A01

A theoretical study is made on plasma dynamics near a space vehicle (SV) injecting ion beam at the initial stage of active experiments in the ionosphere. It is shown that the occurrence of negative potential at SV leads to the formation of a positively charged layer adjoining its surface with size and oscillation amplitude depending on the value and potential increase in velocity. DOE

N92-70245 Academy of Sciences of the Ukrainian SSR, Kharkov. Fiziko-Tekhnicheskij Inst.
NONLINEAR THEORY OF THE RELATIVISTIC ELECTRON FLOW INSTABILITY IN LAMINATED PLASMA BASED ON THE SMITH-PURCELL EFFECT
V. A. BALAKIREV, YU. V. TKACH, and A. R. TOLSTOLUZHSKIJ 1989 19 p In RUSSIAN
(DE92-610955; KFTI-89-54) Avail: CASI HC A03/MF A01

Linear and non-linear theory of short-wave electromagnetic radiation excitation by an electron beam in a plasma diffraction lattice is presented. A case is considered when an electromagnetic wave is emitted at an angle to the beam. It is shown that, depending on the beam and plasma parameters, both vacuum and plasma radiation excitation regimes can be realized. In the first case, instability is linked with charge density. The plasma regime is characterized by the fact that the effective dielectric permittivity of the system is negative. In this case, beam modulation occurs under the influence of fields induced in the plasma. Clusters produced in such a way emit an electromagnetic wave by crossing the lattice. DOE

N92-70264 Academy of Sciences of the Ukrainian SSR, Kharkov. Fiziko-Tekhnicheskij Inst.
AUTOMATIZED COMPLEX OF CORPUSCULAR MEASUREMENTS OF PLASMA PARAMETERS TO MULTICHANNEL ANALYZER OF CHARGE TRANSFER NEUTRALS
V. S. ABDULIN, E. N. SIZAYA, I. I. PATLAJ, A. S. SLAVNYJ, V. V. KRASNYJ, and V. S. TARAN 1989 16 p In RUSSIAN
(DE92-609442; KFTI-89-37) Avail: CASI HC A03/MF A01

A complex of hardware and software means for conducting corpuscular measurements at the 'Uragan' stellarators is described. Apart from computer-compatible electron equipment, algorithms of software resistant to various random errors are developed when creating the complex. Acceptance measuring channels are designed for the work with neutral particle analyzers with detectors on the base of microchannel plates. DOE

N92-70270 Academy of Sciences of the Ukrainian SSR, Kharkov. Fiziko-Tekhnicheskij Inst.
PLASMA SHAPE CONTROL IN TOKAMAK
T. G. KILOVATAYA, V. N. PYATOV, and I. V. YASIN 1989 18 p In RUSSIAN
(DE92-609443; KFTI-89-60) Avail: CASI HC A03/MF A01

Fast algorithms of diagnostic data processing and correction current determination in the tokamak poloidal field windings allow one to organize control of complete plasma current and shape in the feedback regime. The calculation disparallel principle allows one to use the multiprocessor calculating systems in the tokamak poloidal magnetic field control circuit. DOE

N92-71038 Academy of Sciences of the Ukrainian SSR, Kiev. Inst. Teoreticheskoj Fiziki.
ELECTROMAGNETIC EFFECTS IN CONVECTIVE CELLS TURBULENCE
A. G. SITENKO and P. P. SOSENKO 1989 12 p
(DE92-627458; ITP-89-38) Avail: CASI HC A03/MF A01

The main aspects of the statistical theory of low-frequency hydrodynamic fluctuations in a magnetized plasma are reviewed. It is shown that magnetic field fluctuations may influence essentially the potential fluctuation spectral characteristics, which determine the level of anomalous plasma transport. DOE

N92-71039 Academy of Sciences of the Ukrainian SSR, Kiev. Inst. Teoreticheskoj Fiziki.
ELECTRODYNAMIC PROPERTIES OF INHOMOGENEOUS MAGNETOACTIVE PLASMA: LOW-FREQUENCY LIMIT
A. G. SITENKO and P. P. SOSENKO 1989 52 p
(DE92-627459; ITP-89-59) Avail: CASI HC A04/MF A01

Low-frequency nonlinear electrodynamic properties of an inhomogeneous magnetoactive plasma are considered. Nonlinear convective and drift waves in plasma are studied as well. Plasma motion in crossed magnetic and gravitational fields and generation of magnetic fields in plasma are investigated. DOE

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SOLID-STATE PHYSICS

Includes superconductivity.

A92-12790
THERMODYNAMIC PROPERTIES AND PHASE STABILITY IN THE Y-BA-CU-O SYSTEM [TERMODINAMICHESKIE SVOISTVA I USTOICHIVOST' FAZ V SISTEME Y-BA-CU-O]
G. F. VORONIN, S. A. DEGTIAREV, and IU. IA. SKOLIS (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 319, no. 4, 1991, p. 899-905. In Russian. 1991 7 p In RUSSIAN refs
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Experimental results are reported on the thermodynamic functions of the compounds and solutions of the Y-Ba-Cu-O superconducting system. Theoretical models developed for these phases are presented, and calculations are made of subsolidus equilibria with the participation of YBa2Cu3O(6+z), Y2Ba4Cu7O(14+z), and YBa2Cu4O8 phases. These data are necessary for optimizing the conditions of preparation and utilization of superconducting materials. L.M.

A92-13774
EFFECT OF OXYGEN CONTENT ON THE OPTICAL CONSTANT SPECTRA OF BI2SR2CACU2O(Y) HIGH-TEMPERATURE SUPERCONDUCTOR SINGLE CRYSTALS [VLIIANIE SODERZHANIIA KISLORORODA NA SPEKTRY OPTICHESKIKH KONSTANT VTSP MONOKRISTALLOV BI2SR2CACU2O/Y/]
S. I. FROLOV, V. I. GAVRILENKO, V. V. DIAKIN, V. S. EFANOV, M. A. KUZ'MIN, A. P. MOTLIAKH, S. V. MOSHKIN, and M. A. TANATAR (AN USSR, Institut Poluprovodnikov, Kiev, Ukrainian SSR) Optoelektronika i Poluprovodnikovaia Tekhnika (ISSN 0233-7577), no. 20, 1991, p. 46-50. In Russian. 1991 5 p In RUSSIAN refs
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The spectral dependences of the optical constants of Bi2Sr2CaCu2O(y) single crystals with varying oxygen contents have been investigated experimentally using photometric spectral ellipsometry. Measurements have also been made of the resistivity of the samples. The measured values of the real and imaginary parts of the pseudo-dielectric function and the critical temperature are found to correlate with oxygen content. Particularly high sensitivity to oxygen content is observed in the case of a structure in the region 3.5-4.5 eV. Based on an analysis of data in the literature, it is concluded that this region is associated with optical transitions involving Sr-O and Cu-O orbitals. V.L.

A92-21901
ALL-UNION CONFERENCE ON HIGH-TEMPERATURE SUPERCONDUCTIVITY, 3RD, KHARKOV, UKRAINE, APR. 15-19, 1991, PROCEEDINGS [VSESOIUZNOE SOVESHCHANIE PO VYSOKOTEMPERATURNOI SVERKHPROVODIMOSTI, 3RD, KHARKOV, UKRAINE, APR. 15-19, 1991, TRUDY]
Conference sponsored by Mezhvedomstvennyi Nauchnyi Sovet po Probleme Vysokotemperaturnoi Sverkhprovodimosti, AN SSSR, and AN Ukrainy. Fizika Nizkikh Temperatur (ISSN 0132-6414), vol. 17, Oct. 1991, 263 p. In Russian. For individual items see A92-21902 to A92-21921. Oct. 1991 263 p In RUSSIAN
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The conference focused on recent theoretical and experimental research in high-temperature superconductivity. Topics discussed include the chemical molecular mechanisms of high-temperature superconductivity; positron annihilation in high-temperature superconductors; phonons and the mechanism of high-temperature superconductivity; and the role of magnetic electron scattering in high-temperature superconductivity. Papers are also included on electromagnetic wave absorption in thin-film high-temperature superconductors; measurement of critical currents and magnetic permeability in high-temperature superconductors; and zone structure of single-phase high-temperature superconductor ceramics based on bismuth. V.L.

A92-21912
DETECTION OF SUPERCONDUCTIVITY AT 127 K IN Y-SC-BA-CU-O SPECIMENS IN AN ALTERNATING ELECTROMAGNETIC FIELD [OBNARUZHENIE SVERKHPROVODIMOSTI PRI 127 K V OBRAZTSAKH Y-SC-BA-CU-O V PEREMENNOM ELEKTROMAGNITNOM POLE]
A. M. GUREVICH, V. V. DEMIRSKII, V. M. DMITRIEV, V. I. DOTSENKO, V. N. EROPKIN, A. P. ISAKINA, M. N. OFITSEROV, N. N. PRENTSLAU, A. I. PROKHVATILOV, L. V. SHLYK (AN Ukrainy, Fiziko-Tekhnicheskii Institut Nizkikh Temperatur, Kharkov, Ukraine) et al. (Vsesoiuznoe Soveshchanie po Vysokotemperaturnoi Sverkhprovodimosti, 3rd, Kharkov, Ukraine, Apr. 15-19, 1991, Trudy. A92-21901 07-76) Fizika Nizkikh Temperatur (ISSN 0132-6414), vol. 17, Oct. 1991, p. 1358-1362. In Russian. Oct. 1991 5 p In RUSSIAN refs
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Reference is made to an earlier study (Bush et al., 1989) in which it was shown that the addition of Sc and Sr atoms to a yttrium ceramic, (Y(1-x)Sc(x))(Ba(1-y)Sr(y))Cu3O(7-delta), increases the critical superconductivity temperature of the ceramic to 110 K. In the present study, experimental data are presented on the energy absorption of the ceramic at 10 exp 5 - 1.3 x 10 exp 7 Hz, its specific heat, and lattice parameters in the temperature range 78-150 K for x = 0.15, y = 0. At 10 exp 5 Hz, superconductivity is observed at 91.5 K during the cooling of the ceramic. During subsequent heating, the superconducting state is retained up to a temperature of 127 K. V.L.

A92-31914
A DIELECTRIC COMPOSITE BASED ON HIGH TEMPERATURE SUPERCONDUCTORS [DIELEKTRICHESKII KOMPOZIT NA OSNOVE VTSP]
A. M. GRISHIN, N. I. MEZIN, G. S. IAROSH, and N. IU. STAROSTIUK (AN Ukrainy, Donetskii Fiziko-Tekhnicheskii Institut, Donetsk, Ukraine) (Vsesoiuznoe Soveshchanie po Vysokotemperaturnoi Sverkhprovodimosti, 3rd, Kharkov, Ukraine, Apr. 15-19, 1991) Fizika Nizkikh Temperatur (ISSN 0132-6414), vol. 17, Nov.-Dec. 1991, p. 1489, 1490. In Russian. Dec. 1991 2 p In RUSSIAN refs
Copyright

A composite has been prepared using an epoxy matrix and single-phase superconducting powders based on YBa2Cu3O(7-x) ceramic with Tc = 91-93 K. The composite was used to produce strip lines; the microwave characteristics of the lines were measured in the frequency range 8-12 GHz. An analysis of the experimental data shows that small magnetic fields can significantly change the microwave parameters of the strip lines. The dielectric composite can thus be used to produce magnetically controlled microwave components. V.L.

A92-31925
CERAMIC HIGH TEMPERATURE SUPERCONDUCTORS PRODUCED BY SUPERPLASTIC DEFORMATION AND LASER TREATMENT [KERAMICHESKIE VTSP, POLUCHENNYE METODAMI SVERKHPLASTICHNOI DEFORMATSII I LAZERNOI OBRABOTKI]
N. V. GRACHEVA, IU. V. DENISOV, S. M. IVANOVA, V. A. KETSKO, N. T. KUZNETSOV, IU. I. KRASILOV, T. A. PALITSKAIA, S. M. PORTNOVA, R. M. IMAEV, M. F. IMAEV (Rossiiskaia Akademiia Nauk, Institut Obshchei i Neorganicheskoi Khimii, Moscow; Rossiiskaia Akademiia Nauk, Institut Problem Sverkhplastichnosti Metallov, Ufa, Russia) et al. (Vsesoiuznoe Soveshchanie po Vysokotemperaturnoi Sverkhprovodimosti, 3rd, Kharkov, Ukraine, Apr. 15-19, 1991) Fizika Nizkikh Temperatur (ISSN 0132-6414), vol. 17, Nov.-Dec. 1991, p. 1542-1545. In Russian. Dec. 1991 4 p In RUSSIAN refs
Copyright

The objective of the study was to investigate the possibility of

achieving the superplastic state in YBa2Cu3O(7-delta) and to determine its physicochemical and electrophysical properties. In the experiments, superplastic deformation was achieved following dynamic recrystallization during extrusion in the temperature range 850-950 C (0.90-0.99 of the melting temperature) at deformation rates of 10 exp -4/s. It is concluded that extrusion can be used for producing high temperature superconductors with good electrophysical characteristics and also, with additional laser treatment, for fabricating substrates for high-sensitivity superconducting bolometers. V.L.

A92-31926
PRODUCTION OF SUPERCONDUCTING POLYMER-CERAMIC COMPOSITES BASED ON ORGANOSILICON COMPOUNDS [POLUCHENIE SVERKHPROVODIASHCHIKH POLIMER-KERAMICHESKIKH KOMPOZITOV NA OSNOVE KREMNIIORGANICHESKIKH SOEDINENII]
M. I. TOPCHIASHVILI, V. V. KIIANENKO, S. A. TER-GRIGORIAN, I. A. KHERKHEULIDZE, and ZH. K. KUSHASHVILI (Gruzinskii NII Energetiki i Gidrotekhnicheskikh Sooruzhenii, Tbilisi, Georgia) (Vsesoiuznoe Soveshchanie po Vysokotemperaturnoi Sverkhprovodimosti, 3rd, Kharkov, Ukraine, Apr. 15-19, 1991) Fizika Nizkikh Temperatur (ISSN 0132-6414), vol. 17, Nov.-Dec. 1991, p. 1547-1551. In Russian. Dec. 1991 5 p In RUSSIAN refs
Copyright

The development of a new class of high temperature superconductors based on polymer-ceramic composites is reported. The new superconducting materials consist of superconducting yttrium powders and modified commercial glues based on organosilicon compounds. The material is characterized by good workability at the intermediate stage prior to the final heat treatment and can be used for fabrications components of different shapes. The superconducting properties of the composite material are as good as those of pure superconducting ceramics produced under the same conditions while its mechanical properties and thermal cycling stability are improved. V.L.

A92-36521
NONRESONANCE INTERACTION OF ACOUSTIC AND MAGNETOPLASMA WAVES IN A COMPENSATED METAL [NEREZONANSNOE VZAIMODEISTVIE ZVUKOVOI I MAGNITOPLAZMENNOI VOLN V KOMPENSIROVANNOM METALLE]
V. M. GOKHFEL'D (AN Ukrainy, Donetskii Fiziko-Tekhnicheskii Institut, Donetsk, Ukraine) Fizika Nizkikh Temperatur (ISSN 0132-6414), vol. 18, no. 3, March 1992, p. 287-292. In Russian. Mar. 1992 6 p In RUSSIAN refs
Copyright

The nonresonance coupling of ultrasound with a weakly attenuating magnetohydrodynamic wave in the electron-hole compensated-metal plasma is investigated theoretically. It is shown that the interaction of this kind generates an additional wave of mechanical displacements propagating at a supersonic velocity. The relative amplitude of the additional wave is calculated as a function of the intensity of the applied magnetic field for both contact and electromagnetic sound excitation. V.L.

A92-36548
OPTICAL PROPERTIES OF THIN FILMS OF ALUMINUM NITRIDE [OPTICHESKIE SVOISTVA TONKIKH PLENOK NITRIDA ALIUMINIIA]
L. A. ZHILIAKOV and A. V. KOSTANOVSKII (Rossiiskaia Akademiia Nauk, Institut Vysokikh Temperatur, Moscow, Russia) Teplofizika Vysokikh Temperatur (ISSN 0040-3644), vol. 30, no. 2, Mar.-Apr. 1992, p. 290-293. In Russian. Apr. 1992 4 p In RUSSIAN refs
Copyright

Measurements of optical constants (refraction index and absorption coefficient) are presented for thin films of aluminum nitride produced by the thermal nitriding of pure aluminum and reactive evaporation of aluminum nitride in the UV, visible, and near IR regions. The films are found to be highly transparent in the spectral regions investigated. The effect of the structure on the optical properties of the AlN films is discussed. V.L.

A92-42809
KINETICS OF DIAMOND CRYSTALS GROWTH AT HIGH STATIC PRESSURE
N. V. NOVIKOV, S. A. IVAKHNENKO, and M. IA. KATSAI (Ukrainian Academy of Sciences, Institute for Superhard Materials, Kiev, Ukraine) IN: New diamond science and technology; Proceedings of the 2nd International Conference, Washington, DC, Sept. 23-27, 1990 1991 10 p refs
Copyright

Various features of diamond growth kinetics for spontaneous crystallization as well as for diamond growth on seeds are discussed. It is noted that many properties of diamond crystals (such as electrical resistance, thermal conduction, and strength) depend on a monocrystalline structure perfection that is governed by crystal growth kinetics and crystallization conditions. This study employs a technique of thermocycling and induced striation for investigating the kinetics and the conditions of diamond-crystal growth. R.E.P.

A92-44056
EFFECT OF THE STRUCTURAL STATE OF COPPER ON THE PROPERTIES OF SUPERCONDUCTING COMPOSITES YBA2CU3O(7-X)/CU [VLIIANIE STRUKTURNOGO SOSTOIANIIA MEDI NA SVOISTVA SVERKHPROVODIASHCHIKH KOMPOZITOV YBA2CU3O/7-X/CU]
N. V. BELIAEVA, V. A. VARAVIN, E. M. GOLOLOBOV, and A. S. MASAKOVSKAIA Pis'ma v Zhurnal Tekhnicheskoi Fiziki (ISSN 0320-0116), vol. 18, no. 5, March 12, 1992, p. 33-37. In Russian. 12 Mar. 1992 5 p In RUSSIAN refs
Copyright

The objective of the study was to investigate the possibility of using a metal component, Me, with a modified structure in the two-phase system YBaCuO/Me in order to prevent the irreversible oxygen loss by the 123 phase and to determine the effect of the system composition on its electrophysical and mechanical properties. Of the metals considered (Cu, Ni, Fe, Co, Ti, Zr, Al, Mo, and Nb), only copper with a sufficiently loosened structure is found to be capable of providing for free oxygen migration. The addition of radiation-modified copper is shown to improve parameters that characterize the superconducting properties of the ceramic. In particular, it leads to an increase in the volume of the superconducting phase, an increase of the superconducting transition temperature, and a decrease in the transition width. V.L.

A92-53800
SUPERCONDUCTIVITY AND FLOW STRESS OF AL-LI ALLOYS NEAR 1 K
V. V. PUSTOVALOV, N. V. ISAEV, V. S. FOMENKO, S. E. SHUMILIN, N. I. KOLOBNEV, and I. N. FRIDLIANDER (Ukrainian Academy of Sciences, Physico-Technical Institute of Low Temperatures, Kharkov, Ukraine) Cryogenics (ISSN 0011-2275), vol. 32, no. 8, 1992, p. 707-710. 1992 4 p refs
Copyright

Superconductivity was discovered in Al-Li, Al-Mg-Li-Zr, and Al-Cu-Li-Zr alloys, and the critical parameters of the superconductors were estimated. The sensitivity of the flow stress and serrated deformation with respect to the electron state of the sample were observed. The applied magnetic field and the temperature dependence of the flow stress change Delta(Sigma sub sn) at the superconducting transition were studied in the interval from Tc to 0.5 K. Author

A92-56600
METHOD OF LASER-ION DEPOSITION OF DIAMONDLIKE CARBON FILMS
EVGENII V. CHARYSHKIN (Joint Venture NINATRACK, Moscow, Russia) and NURLAN Z. SAKIPOV (Russian Academy of Sciences, Institute of Chemical Physics, Chernogolovka, Russia) Journal of

Applied Physics (ISSN 0021-8979), vol. 72, no. 6, Sept. 15, 1992, p. 2508-2510. 15 Sep. 1992 3 p refs
Copyright

Diamondlike films were prepared by deposition from laser plasma with simultaneous irradiation of growing film by hydrogen ions. Optical and electrophysical characteristics of these films were studied. The results obtained indicated essential improvement of diamondlike features. Author

N92-26322# Leningrad Nuclear Physics Inst. (USSR).
THE HIGH RESOLUTION DIFFRACTOMETER MINI-SFINKS
V. A. TRUNOV (Technical Research Centre of Finland, Espoo.), V. A. KUDRYASHEV (Technical Research Centre of Finland, Espoo.), V. A. ULYANOV (Technical Research Centre of Finland, Espoo.), A. P. BULKIN (Technical Research Centre of Finland, Espoo.), V. G. MURATOV (Technical Research Centre of Finland, Espoo.), T. K. KOROTKOVA (Technical Research Centre of Finland, Espoo.), A. F. SHCHEBETOV (Technical Research Centre of Finland, Espoo.), P. HIISMAEKI (Technical Research Centre of Finland, Espoo.), H. POEYRY (Technical Research Centre of Finland, Espoo.), A. TIITTA (Technical Research Centre of Finland, Espoo.) et al. *In* Technical Research Centre of Finland, Development and Applications of the Reverse Neutron Time-of-Flight Method with Fourier-Type Beam Chopper 60 p Sep. 1991 In RUSSIAN; ENGLISH summary Repr. from Leningrad Nuclear Physics Inst., no. 1277 (Leningrad, USSR), 1987 60 p
Copyright Avail: CASI HC A04/MF A02

The theoretical principles of the reverse time of flight method, the main concepts of the calculation and optimization of the neutron guides and information about the time focusing conditions in the time of flight method are reported. The description of the time of flight high resolution diffractometer 'Mini-SFINKS' and some experimental results are presented. ESA

77

THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics.

A92-15007
RELAXATION PHENOMENA IN A FREE MOLECULAR FLOW INTERACTING WITH THE CONCAVE SURFACE OF A SOLID THERMOSTAT [RELAKSATSIONNYE IAVLENIIA V SVOBODNOMOLEKULIARNOM POTOKE, VZAIMODEISTVUIUSHCHEM S VOGNUTOI POVERKHNOST'IU TVERDOGO TERMOSTATA]
L. P. GASHTOL'D (LFEI, Leningrad, USSR) IN: Dynamic processes in gases and solid bodies 1990 9 p In RUSSIAN refs
Copyright

The interaction between a multiple-velocity flow of a collisionless monoatomic gas and the concave surface of a solid thermostat with a specified temperature is investigated analytically for the case of the steady-state interaction regime. The heterogeneous system considered here is shown to be strongly nonequilibrium. A method is proposed for the approximate calculation of the number of reflections of the gas flow from the thermostat surface required for full accommodation. The application of the method to the calculation of the aerodynamic characteristics of nonconvex bodies in free molecular gas flows is discussed. V.L.

A92-15009
THE WEAK EFFECT OF THE ACCURACY OF THE DESCRIPTION OF PHASE INTERACTION ON THE PARAMETERS OF NONSINGLE-PHASE SUPERSONIC FLOW [O SLABOM VLIIANII TOCHNOSTI OPISANIIA FUNKTSII MEZHFAZNOGO VZAIMODEISTVIIA NA PARAMETRY NEODNOFAZNOGO SVERKHZVUKOVOGO TECHENIIA]
G. T. ALDOSHIN, V. IU. KRUGLOV, G. F. KUZ'MENKO, and T. N. RIABININA (Leningradskii Mekhanicheskii Institut, Leningrad, USSR) IN: Dynamic processes in gases and solid bodies 1990 6 p In RUSSIAN refs
Copyright

Based on numerical calculations of nonsingle-phase monodisperse and polydisperse flows in nozzles and supersonic jets, the drag and heat transfer coefficients of foreign particles in flow of a gas are investigated parametrically. It is shown that the presence of feedback in equations describing flow of a nonsingle-phase mixture with allowance for the effect of the particles on the carrier gas leads to a weak dependence of the mixture macroparameters (velocity, temperature, and phase density) over a wide range of particle drag and heat transfer characteristics. V.L.

A92-19744
THERMODYNAMIC AND OPTICAL PROPERTIES OF PLASMA, METALS, AND DIELECTRICS
IU. V. BOIKO, IU. M. GRISHIN, A. S. KAMRUKOV, L. V. KOVALENKO, and S. N. CHUVASHEV New York, Hemisphere Publishing Corp., 1991, 419 p. Translation. 1991 419 p refs
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The handbook contains analytically derived data on the principal thermodynamic and optical properties of the plasma of a variety of metals and dielectrics. In particular, data are included on the partial composition, degree of ionization, pressure, internal energy, effective adiabatic exponent, absorption coefficients, and Rosseland-averaged radiation mean free path of the plasma of metals and dielectrics at temperatures between 1000 and 10 exp 6 K and plasma densities of 10 exp -4 to 1 kg/cu m. The materials covered include copper, stainless steel, tungsten, molybdenum, tantalum, zirconium, chromium, niobium, nickel, silicon, ZrO2, SiO2, Teflon, Plexiglas, textolite, polyformaldehyde, and caprolactum V.L.

A92-21540
MODELING OF A RAREFIED GAS BY A SYSTEM OF A SMALL NUMBER OF PARTICLES [MODELIROVANIE RAZREZHENNOGO GAZA SISTEMOI MALOGO CHISLA CHASTITS]
S. F. GIMEL'SHEIN and V. IA. RUDIAK Pis'ma v Zhurnal Tekhnicheskoi Fiziki (ISSN 0320-0116), vol. 17, Oct. 12, 1991, p. 74-77. In Russian. 12 Oct. 1991 4 p In RUSSIAN refs
Copyright

The application of the direct statistical modeling approach to the study of rarefied gases is made difficult by the rapid increase in dynamic correlations resulting from the finite number, N, of molecules in the modeled system. As a result, such modeling leads to solutions that are different from the solution of the Boltzmann equation describing rarefied gas dynamics. Here, a modified version of the direct statistical modeling method is proposed which makes it possible to eliminate this difficulty. The accuracy of the modified method is demonstrated by comparing the result with an exact BKW solution of the Boltzmann equation for a system with N = 1000. V.L.

A92-49843
ON APPROXIMATING THERMODYNAMIC PROPERTIES OF INDIVIDUAL SUBSTANCES
A. F. DREGALIN and R. R. NAZYROVA (Kazan Aviation Institute, Russia) Journal of Aerospace Power (ISSN 1000-8055), vol. 7, no. 3, July 1992, p. 269-271. Jul. 1992 3 p refs

A method is presented, with regard for the fixed points, for complex approximation of the thermodynamic functions, such as enthalpy, entropy and heat capacity, which has been successfully used in approximating about 1500 tables within temperature range from 100 to 20,000 K. The results of the thermodynamic calculations of mixture parameters on the basis of TD soft system which includes the program approximation package show high reliability of the polynomials in solving iteration problems for computing multicomponent systems. Author

A92-50696
THE PROBLEMS OF THERMODYNAMIC CHARACTERIZATION OF DIRECT CONVERSION PROCESS OF THERMAL-TO-ELECTRIC ENERGY IN APPROXIMATION OF CLASSIC IDEAL GAS
V. A. GRODKO (VNIITFA, Moscow, Russia) IN: IECEC '91; Proceedings of the 26th Intersociety Energy Conversion Engineering Conference, Boston, MA, Aug. 4-9, 1991. Vol. 3 1991 6 p refs
Copyright
The problem of the noncontradiction of the model of the classic ideal gas is examined. It is pointed out that the possibility of noncontradictory characterization of states of many 'free' charges in substances and the processes of their diffusion and transport by means of entropy and phase transitions is related to the choice of a suitable model meeting the requirements of completeness and noncontradiction. The concept considered is related to the thermodynamic cycle of the thermal-to-electric energy conversion process. I.E.

A92-52642
EXPERIMENTAL STUDY OF CRYOGENIC LIQUIDS IN THE METASTABLE SUPERHEATED STATE
V. G. BAIDAKOV and V. P. SKRIPOV (Russian Academy of Sciences, Institute of Thermal Physics, Yekaterinburg, Russia) Experimental Thermal and Fluid Science (ISSN 0894-1777), vol. 5, no. 5, Sept. 1992, p. 664-678. Sep. 1992 15 p refs
Copyright
The results of an experimental investigation of cryogenic liquids in a metastable (superheated) state are considered. Data are presented on the maximum attainable superheat temperature of typical cryogenic liquids from atmospheric to close to critical pressures. The nucleation mechanism and the influence of factors that induce boiling on the attainable superheat of liquids are discussed. The results of experiments are compared with theory. Data on the thermodynamic properties of cryogenic liquids in a metastable state are presented. The construction of the equation of state of metastable liquids is discussed. Explosive boiling phenomena connected with large superheats of cryogenic liquids are considered, and the discharge of cryogenic liquids through short tubes and the heat interaction of cold liquid droplets with a hot surface are investigated. Author

A92-52709
ONSAGER RECIPROCITY RELATIONS IN RAREFIED MOLECULAR GAS FLOWS
F. M. SHARIPOV (Ural State University, Yekaterinburg, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 8 p refs
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A rarefied molecular-gas flow in an arbitrary region at an arbitrary Knudsen number is considered. An open system is assumed (i.e., an exchange of mass, momentum, and energy on a region boundary is possible). Based on the linearized Boltzmann equation and using the fundamental property of a boundary condition, general expressions of kinetic coefficients to satisfy Onsager reciprocity relations are obtained. A more detailed analysis is performed for three problems of the rarefied gas dynamics: a two-dimensional paramagnetic gas flow through a short channel, a rarefied gas flow around an arbitrary body, and a light induced gas drift. Author

A92-52741
EQUILIBRIUM AND NONEQUILIBRIUM STATIONARY STATES OF GAS MIXTURES WITH PHYSICAL CHEMICAL TRANSFORMATIONS
M. A. RYDALEVSKAIA (St. Petersburg State University, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 6 p refs
Copyright
The investigation of equilibrium and nonequilibrium states of gas mixtures with physical-chemical transformations is very important in connection with the problems of chemical technology, laser physics, and gasdynamics. It is connected with the minimal number of main macroparameters, allowing to describe gasdynamics at a flow in a closed form. This problem by means of the kinetic equations for the distribution functions and by means of the statistical thermodynamics methods is considered. In the report, the distribution functions are derived, the connection of intensive parameters, forming part of the most probable distributions, with the main extensive parameters are investigated, and examples of chemical reacting gas mixtures in the states of complete equilibrium and incomplete equilibrium (vibrationally nonequilibrium) are considered. Author

A92-52760
THEORETICAL ANALYSIS OF TRADITIONAL AND MODERN SCHEMES OF THE DSMC METHOD
M. S. IVANOV (Russian Academy of Sciences, Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia) and S. V. ROGASINSKII (Russian Academy of Sciences, Computing Center, Novosibirsk, Russia) IN: Rarefied gas dynamics; Proceedings of the 17th International Symposium, Aachen, Germany, July 8-14, 1990 1991 14 p refs
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A direct statistical simulation of rarefied gas flows is developed. Using this analysis, different exact and approximate numerical schemes are computed, and it is shown that, under certain conditions, the traditional schemes of the direct simulation Monte Carlo method follow these schemes. A number of new economical numerical schemes are constructed, and a practical criterion is proposed for estimating the effect of the statistical relationship between model particles on the results of calculations. I.S.

N92-14886# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Ehnergij.
GROSS-NEVEU MODEL AND OPTIMIZED EXPANSION METHOD
K. G. KLIMENKO 1990 17 p
(DE91-636082; IHEP-OTF-90-95; IFVE-OTF-90-95) Avail: CASI HC A03/MF A01
An alternative approach to the study of the D-dimensional (D = 2, 3) Gross-Neveu model using optimized expansion (OE) technique is proposed. A modified optimizing principle for the case of D = 2 and a generalized optimizing principle for D = 3 are proposed which allow to obtain effective potential with an accuracy up to the second OE order. A phase structure, similar to the one in the 1/N expansion method is predicted. DOE

N92-14890# Joint Inst. for Nuclear Research, Dubna (USSR).
PHASE SPACE STRUCTURE IN GAUGE THEORIES
S. V. SHABANOV 1989 88 p In RUSSIAN; ENGLISH summary
(DE91-623483; JINR-R-2-89-533) Avail: CASI HC A05/MF A01
The lectures are devoted to the new aspect of dynamical systems with gauge groups, the phase space reduction of physical degrees of freedom. The physical phase space structure in many models with a gauge symmetry and with commuting and anticommuting variables, including Yang-Mills fields and Glashow-Weinberg-Salam model, is studied. Some physical consequences of the phase space reduction are discussed. DOE

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SOCIAL SCIENCES (GENERAL)

Includes educational matters.

A92-55807
EXPERIENCE IN TRAINING SPECIALISTS IN THE FIELD OF APPLIED ASTRONAUTICS
VIKTOR P. SAVINYKH (Moscow Institute of Geodesy, Aerophotosurveying and Cartography, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 4 p. Aug. 1992 4 p
(IAF PAPER 92-0468) Copyright

The specialization called Space Geodesy, later called Space Geodesy and Navigation, was introduced at the Moscow Institute of Geodesy, Aerophotosurveying, and Cartography in 1968 for training specialists in the field of applied astronautics. In 1980, the Faculty of Applied Astronautics (FAA) was introduced, based, initially, on four departments (Astronomy and Space Geodesy; Physical Geography and Space Imagery Interpreting; Electrical Engineering, Automatic and Electronic Equipment; and Computing Engineering and Automated Aerospace Information Processing), to which a fifth department, Safety Life-Support System, was added in 1991. The paper describes the type of problems that graduates of these departments are trained to solve, the approaches used to select students for the FAA, the training approaches, and the instruments available for training. Efforts for achieving international integration in the field of training remote-sensing specialists are discussed. I.S.

A92-55821
STUDENTS EDUCATION AND SCIENTIFIC RESEARCH INTEGRATION (FROM THE MOSCOW AVIATION INSTITUTE EXPERIENCE)
V. V. MALYSHEV, M. N. KRASIL'SHCHIKOV, A. V. FEDOROV, and A. V. LESHCHENKO (Moscow Aviation Institute, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. Aug. 1992 10 p
(IAF PAPER 92-0495) Copyright

A review of pedagogical methods for aerospace training and research in the former Soviet Union is given emphasizing the integration of education and scientific activity. The academic process is supplemented with education-research work, and students are required to collaborate with scientific organizations as part of preprofessional training. The academic approach is intended to facilitate the transition from the educational environment to the professional arena. C.C.S.

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DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography.

A92-14275
COLLECTION, ACCUMULATION, AND PROCESSING OF HYDROMETEOROLOGICAL INFORMATION [SBOR, NAKOPLENIE I OBRABOTKA GIDROMETEOROLOGICHESKOI INFORMATSII]
V. M. VESELOV, ED. and E. P. RYZHIKH, ED. Moscow, Gidrometeoizdat (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Gidrometeorologicheskoi Informatsii - Mirovoi Tsentr Dannykh, Trudy, No. 155), 1990, 136 p. In Russian. No individual items are abstracted in this volume. 1990 136 p In RUSSIAN
Copyright

Automatic processes used for the collection, storage, and propagation of hydrometeorological information are discussed. Attention is given to the systematics of scientific documents stored by the Gidrometfond, methods for regulation of multivolume families of files, the adaptive quality control and regulation of meteorological information, and organization of automatic control of hydrometeorological information. Special consideration is given to the development of adaptive data control by using expert systems, a model concept of operative meteorological data, the meteorological support of aviation based on a meteorological aviation data base, and the development of a computer-program/technological data base complex for the automation of industrial-type informational technology. I.S.

N92-30509# Science Applications International Corp., San Diego, CA. Foreign Applied Sciences Assessment Center.
SOVIET APPLIED INFORMATION SCIENCES IN A TIME OF CHANGE
J. BENGSTON, R. R. CRONIN, and R. B. DAVIDSON Jul. 1991 91 p
(PB92-173020) Avail: CASI HC A05/MF A01

The current state of the information sciences in the Soviet Union and the effects of information science capabilities upon other areas of Soviet science and technology are characterized. Estimates are given of the likely effect of the political and social reforms underway in the Soviet Union on the future Soviet progress in the information sciences and, at a more general level, in science and technology. As in other areas of science, Soviet researchers are better in the theoretical aspects of the information sciences than in the applications. Moreover, the Soviets are unable to match either the quality or quanities of the tools of the applied information sciences that are produced in the West. Soviet scientists remain unable to produce computers of any size in the desired quantities. The lack of capable computers is a serious impediment to computer-aided design of very large-scale integrated circuits, while the Soviet microelectronics industry lacks both automated test equipment and automated controls for processing equipment.
Author

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LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

A92-51865
NUCLEAR ACCIDENTS ON SPACE OBJECTS WITH NUCLEAR POWER SOURCES - APPLICABLE INTERNATIONAL LAW
E. MOLODTSOVA (Russian Academy of Sciences, Institute of State and Law, Moscow, Russia) IN: Colloquium on the Law of Outer Space, 34th, Montreal, Canada, Oct. 5-11, 1991, Proceedings 1992 8 p refs
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The international law process that would be set in motion by a nuclear accident aboard a space object is described. The responsibilities of the launching state are examined, as are the legal obligations of assisting states. Liability for an accident is addressed. C.D.

A92-55721
INTERNATIONAL COOPERATION IN FUNDAMENTAL SPACE RESEARCH - PAST EXPERIENCE AND PERSPECTIVES
A. A. GALEEV (Russian Academy of Sciences, Space Research Institute, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 6 p. Aug. 1992 6 p refs
(IAF PAPER 92-0290) Copyright

The experience of international cooperation in past space projects on solar system exploration (Vega, Phobos, and Roentgen)

is evaluated, and the prospects for such cooperation in future space missions such as Mars-94, Mars-96, Spectrum-X, and Interball are discussed. Particular attention is given to the successful international cooperation in the investigations of Comet Halley in March 1986 during the flyby of Vega-1 and Vega-2, Giotto, and Suisei and Sakigake through the cometary coma, as well as the international collaboration in the Phobos experiment. The possible implications of Russian economic difficulties for international space cooperation are addressed. C.A.B.

N92-70310 National Science Foundation, Washington, DC. Div. of International Programs.
INTERNATIONAL SCIENCE AND TECHNOLOGY INSIGHT
EMILY B. RUDIN, ed. 1990 43 p
(NSF-90-141) Avail: CASI HC A03

The topics covered include: (1) science policy in the Soviet Union; (2) rethinking U.S.-Soviet scientific cooperation; (3) excerpts from a workshop on U.S.-USSR science and engineering indicators; (4) a summary of the current state of knowledge about Soviet science and technology training and personnel; (5) precollege education in science and mathematics in the USSR; and (6) structure and change in the Soviet Academy of Sciences.
Author

85

URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

N92-14934# National Science Foundation, Washington, DC. Div. of International Programs.
INTERNATIONAL SCIENCE AND TECHNOLOGY INSIGHT, VOLUME 3, NUMBER 1
EMILY B. RUDIN, ed. 1991 53 p
(NSF-91-14) Avail: CASI HC A04/MF A01

A compilation is presented of articles devoted to information and analysis on foreign science and technology policy, research developments and program, and international cooperation in science and engineering research and education. Some representative titles include the following: Science in Bulgaria; Electronic Communications in the Soviet Union; Science Policy in India - What Directions in a Multipolar World; U.S. Cooperation with the Soviet Union in Nuclear Energy. E.R.

88

SPACE SCIENCES (GENERAL)

A92-57347
SETI IN RUSSIA
NIKOLAI S. KARDASHEV and V. I. ZHURAVLEV (Russian Academy of Sciences, Institute of Physics, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 4 p. Aug. 1992 4 p refs
(IAF PAPER 92-1026) Copyright

An overview of SETI research in Russia is presented. Three principal directions for astronomical investigations are considered: searching for astroengineering constructions, searching for communication signals, and the investigation of conditions for the existence of extraterrestrial intelligence. As a working model for these investigations, it is assumed that the highest level of development of an extraterrestrial civilization corresponds to the highest level of utilization of solid space structures and the highest level of energy consumption. R.E.P.

89

ASTRONOMY

Includes radio, gamma-ray, and infrared astronomy; and astrometry.

A92-40758
X-RAY MAP OF THE GALACTIC CENTER REGION OBTAINED WITH THE ART-P TELESCOPE ON BOARD THE GRANAT OBSERVATORY [RENTGENOVSKAIA KARTA OBLASTI GALAKTICHESKOGO TSENTRA, POSTROENNAIA TELESKOPOM ART-P OBSERVATORII 'GRANAT']
M. N. PAVLINSKII, S. A. GREBENEV, and R. A. SIUNIAEV (Rossiiskaia Akademiia Nauk, Institut Kosmicheskikh Issledovanii, Moscow, Russia) Pis'ma v Astronomicheskii Zhurnal (ISSN 0320-0108), vol. 18, no. 4, April 1992, p. 291-302. In Russian. Apr. 1992 12 p In RUSSIAN refs
Copyright

Observations of the Galactic center with the ART-P telescope on board the Granat observatory are reported. The Galactic center was observed four times over a span of two years, from spring 1990 to autumn 1991. The observations were repeated every six months. A map of the Galactic center was constructed for each observation period. The ART-P telescope detected the X-ray flux from a total of 12 sources, eight of which were known previously, and four were observed for the first time. Luminosity data for all the sources are presented for each observation period. P.D.

N92-12955*# Abastumani Astrophysical Observatory, Georgia (USSR).
GEORGIAN SPACE RESEARCH PROGRAM
G. P. KAKHIDZE *In* NAS-NRC, High-Energy Astrophysics. American and Soviet Perspectives p 218-224 1991
Avail: CASI HC A02/MF A04

Considerations are presented of telescopes and spectrometers planned to be designed and made by the Abastumani Astrophysical Observatory of the Georgian SSR Academy of Science. The purpose of this topic is to clarify actual scientific problems which are to be solved by using telescopes. The experiments will begin in 1995. Author

N92-34195*# American Astronomical Society, Washington, DC.
THE 30TH AAS GODDARD MEMORIAL SYMPOSIUM. WORLD SPACE PROGRAMS AND FISCAL REALITY: SYNOPSIS
1992 33 p Presented in Alexandria, VA, 9-10 Apr. 1992
(NASA-TM-107971; NAS 1.15:107971) Avail: CASI HC A03/MF A01

A full proceedings of the symposium will be issued later in the year. This synopsis consists of summations of three sessions by appointed rapporteurs. International figures in space and in politics spoke at the sessions. Themes of international cooperation and fiscal reality pervaded the conference. International speakers from Canada, the European Space Agency, Russia, Japan and China and other countries addressed the topic of the symposium. American representation included Senator Barbara Mikulski, former NASA administrator James Beggs and other speakers. R.L.B.

90

ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

A92-10011
PERMANENT AND NONSTATIONARY PLASMA PHENOMENA IN COMET HALLEY'S HEAD
K. I. GRINGAUZ and M. I. VERIGIN (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR) IN: Cometary plasma processes 1991 10 p refs
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The characteristics of various plasma phenomena observed near Comet Halley in 1986 are studied to determine whether or not they are permanent features of the comet. Taking as the criteria for permanence that they should be observed by all spacecraft or be physically explicable, the permanent features include the near-cometary bow shock, the cometosheath, with its unique energy distribution of ions, the systematic cooling of electrons in this region, the cometopause, and the tangential discontinuity near the cometary nucleus. Among nonstationary events observed there are the unusual bursts of ions with energies 100-1000 eV recorded in a direction from the sun in the region of cometary ions at r = 10,000-20,000 km, the magnetic field pile-up boundary (in the region of the cometopause), the mystery region, and the precipitation of energetic electrons with about 1 keV at r = 1500-2500 km. Author

A92-10033
NEUTRAL HYDROGEN SHELL STRUCTURE NEAR COMET P/HALLEY DEDUCED FROM VEGA-1 AND GIOTTO ENERGETIC PARTICLE DATA
M. I. VERIGIN (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR), S. MCKENNA-LAWLOR (St. Patrick's College, Maynooth, Republic of Ireland), A. K. RICHTER (Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau, Federal Republic of Germany), K. SZEGO (Central Research Institute for Physics, Budapest, Hungary), and I. S. VESELOVSKII (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) IN: Cometary plasma processes 1991 5 p refs
Copyright

An existing model based on Vega-1 (Tunde-M) and Giotto (EPONA) energetic particle data, representing neutral gas shells expanding about Comet Halley, has been updated by incorporating additional information concerning energetic particles recorded by Tunde-M, and neutral gas measurements recorded aboard the Vega-1 and Vega-2 spacecraft, in the original data set. The modified model reproduces reasonably well the positions of the maxima in the intensity profiles of energetic cometary ions observed along the Vega and Giotto trajectories, and it is estimated that the velocity of gas in the envisioned neutral shells is about 7.3 km/s, i.e., close to the velocity (about 8 km/s) of the slow hydrogen component of cometary neutrals. Detailed arguments are presented to support the suggestion that, at distances of 2-10 x exp 6 km from the comet nucleus, the energetic particles recorded in the quasi-periodic structures identified by the Tunde-M and EPONA instruments were protons. Author

A92-19542
THE ORIGIN OF THE ANGULAR MOMENTUM DISTRIBUTION IN THE SOLAR NEBULA
A. D. CHERNIN (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Astrophysics and Space Science (ISSN 0004-640X), vol. 186, no. 1, Dec. 1991, p. 159, 160. Dec. 1991 2 p refs
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The present study proposes supersonic noncentral collision and coalescence of interstellar matter as a physical process that could lead to the formation of a solar nebula with an appropriate distribution of the spin angular momentum. An idealized chain of events is outlined which may make possible a relevant distribution of the angular momentum due to the very process of the nebula formation, but not internal distribution of it. P.D.

A92-21665
THE POSSIBILITY OF THE DETERMINATION OF NONLINEAR LIMB-DARKENING LAWS FROM MODELS OF STELLAR ATMOSPHERES AND BY THE ANALYSIS OF SOLUTIONS OF LIGHT CURVES OF CLASSICAL ECLIPSING SYSTEMS [O VOZMOZHNOSTI OPREDELENIIA NELINEINYKH ZAKONOV POTEMNENIIA IZ MODELEI ZVEZDNYKH ATMOSFER I ANALIZA RESHENII KRIVYKH BLESKA KLASSICHESKIKH ZATMENNYKH SISTEM]
A. A. RUBASHEVSKII (Glavnaia Astronomicheskaia Observatoriia; AN Ukrainy, Institut Problem Materialovedeniia, Kiev, Ukraine) Astronomicheskii Zhurnal (ISSN 0004-6299), vol. 68, Nov.-Dec. 1991, p. 1247-1260. In Russian. Dec. 1991 14 p In RUSSIAN refs
Copyright

A92-27581
BROADBAND X-RAY SPECTRA OF BLACK HOLE CANDIDATES, X-RAY PULSARS, AND LOW-MASS X-RAY BINARIES - RESULTS FROM THE KVANT MODULE [SHIROKOPOLOSNYE RENTGENOVSKIE SPEKTRY KANDIDATOV V CHERNYE DYRY, RENTGENOVSKIKH PUL'SAROV I MALOMASSIVNYKH DVOINYKH RENTGENOVSKIKH SISTEM - REZUL'TATY MODULIA 'KVANT']
R. A. SIUNIAEV, V. A. AREF'EV, K. H. BOROZDIN, M. R. GIL'FANOV, V. V. EFREMOV, A. S. KANIOVSKII, E. M. CHURAZOV, E. KENDZIORRA, B. MONY, P. KRETSCHMAR (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR; Tuebingen, Universitaet; Max-Planck-Institut fuer Physik und Astrophysik, Garching, Federal Republic of Germany; Birmingham, University, England) et al. Pis'ma v Astronomicheskii Zhurnal (ISSN 0320-0108), vol. 17, Nov. 1991, p. 975-984. In Russian. Nov. 1991 10 p In RUSSIAN refs
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The broadband spectra of the brightest X-ray sources observed by the TTM, Hexe, and Pulsar X-1 devices of the Kvant module are discussed. They demonstrate the differences in the hardness of the spectra of neutron stars with a weak magnetic field, namely, Sco X-1, X-ray pulsars A0535 + 26, Vela X - 1, LMC X - 4, and the black hole candidates Cyg X - 1, GS2023 + 338, GS2000 + 25, and 3C273. P.D.

A92-27641
OPTIMAL TWO-IMPULSE TRANSFERS TO THE L2 LIBRATION POINT OF THE SUN-EARTH SYSTEM USING ASYMPTOTIC TRAJECTORIES [OPTIMAL'NYE DVUKHIMPUL'SNYE PERELETY V TOCHKU LIBRATSII L2 SISTEMY SOLNTSE-ZEMLIA S ISPOL'ZOVANIEM ASIMPTOTICHESKIKH TRAEKTORII]
I. A. SUBAEV (Moskovskii Gosudarstvennyi Universitet, Moscow, Russia) Moskovskii Universitet, Vestnik, Seriia 3 - Fizika, Astronomiia (ISSN 0579-9392), vol. 32, Sept.-Oct. 1991, p. 102-104. In Russian. Oct. 1991 3 p In RUSSIAN refs
Copyright

The paper is concerned with the problem of determining optimal two-impulse transfer trajectories, including transfers to the L2 libration point with and without the use of asymptotic trajectories. It is shown that the use of asymptotic trajectories makes it possible to reduce the energy requirements for a transfer from a near-earth circular satellite orbit to the L2 libration point of the sun-earth system. V.L.

A92-28166
ULTRAVIOLET OBSERVATIONS IN PUPPIS WITH THE SPACE TELESCOPE 'GLAZAR'
G. M. TOVMASIAN, R. KH. OGANESIAN, R. A. EPREMIAN (Biurakanskaia Astrofizicheskaia Observatoriia, Byurakan, Armenia), D. HUGUENIN (Geneve, Observatoire, Sauverny, Switzerland), IU.

M. KHODZHAIANTS, M. N. KRMOIAN, A. L. KASHIN (Granit Construction Bureau, Armenian SSR), A. P. ALEKSANDROV, and IU. V. ROMANENKO Astrophysics and Space Science (ISSN 0004-640X), vol. 188, no. 2, Feb. 1992, p. 217-231. Feb. 1992 15 p refs
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The results of observations of 159 stars at 1640 A in Puppis made with the space telescope 'Glazar' are presented. It is shown that the observed stars are members of different groups of stars situated at distances of about 120, 370, 700, 1250, 2400, and 4000 pc. The last two groups belong to the Pup OB1 and Pup OB2 stellar associations. There is relatively little absorption in the observed region. The absorbing matter is mainly concentrated in small clouds. It is suggested that three stars - CP - 27 deg 4197, HD 60479, and HD 61672 - are embedded in a dust envelope and that the star HD 60057 has a hot subdwarf companion. Forty-four of the observed stars are new OB or early A-type stars, spectral types of which were not known. Author

A92-30297
THE PLASMA-WAVE EXPERIMENT ON THE VEGA INTERPLANETARY PROBES [EKSPERIMENT PO IZUCHENIIU PLAZMENNYKH VOLN NA MEZHPLANETNYKH STANTSIIAKH 'VEGA']
S. I. KLIMOV, V. E. KOREPANOV, P. M. SOPRUNIUK, and S. A. SAVIN Kosmicheskaia Nauka i Tekhnika (ISSN 0321-4508), no. 5, 1990, p. 80-89. In Russian. 1990 10 p In RUSSIAN refs
Copyright

The paper describes the instruments and methods used in a study of plasma waves conducted aboard the Vega-1 and -2 interplanetary spacecraft, with special attention given to the characteristics of the two plasma wave analyzers (PWAs) used in the study: the PWA for low-frequency plasma waves and the PWA for high frequencies. Results are presented together with interpretation. I.S.

A92-36601
FINITE PARAMETRIC INVERSE PROBLEMS IN ASTROPHYSICS [KONECHNOPARAMETRICHESKIE OBRATNYE ZADACHI ASTROFIZIKI]
ALEKSANDR V. GONCHARSKII, SERGEI IU. ROMANOV, and ANATOLII M. CHEREPASHCHUK Moscow, Izdatel'stvo Moskovskogo Universiteta, 1991, 192 p. In Russian. 1991 192 p In RUSSIAN refs
(ISBN 5-211-00973-8) Copyright

Methods and results of the solution of inverse problems in astrophysics using parametric models are examined. In particular, stable methods for solving inverse problems with a statistical error model are described. Statistical theorems are presented which provide the basis for efficient methods of obtaining the confidence limits (errors) of the unknown parameters of a model. New mathematical results are obtained for nonlinear parametric problems. Astrophysical results are presented concerning the physics and evolution of close binaries, stellar occultation by the moon, and determination of the light curve variations of nonstationary stars. V.L.

A92-40683
X-RAY STUDIES OF THE PULSAR HERCULES X-1 FROM THE ASTRON SPACE STATION [RENTGENOVSKIE ISSLEDOVANIIA PUL'SARA GERKULES X-1 NA AVTOMATICHESKOI STANTSII 'ASTRON']
E. K. SHEFFER, I. F. KOPAEVA, M. B. AVERINTSEV, G. S. BISNOVATYI-KOGAN, I. M. GOLYNSKAIA, L. S. GURIN, A. V. D'IACHKOV, V. M. ZENCHENKO, V. G. KURT, T. A. MIZIAKINA (Rossiiskaia Akademiia Nauk, Fizicheskii Institut and Institut Kosmicheskikh Issledovanii; Moskovskii Gosudarstvennyi Universitet, Moscow, Russia) et al. Astronomicheskii Zhurnal (ISSN 0004-6299), vol. 69, no. 1, Jan.-Feb. 1992, p. 82-105. In Russian. Feb. 1992 24 p In RUSSIAN refs
Copyright

The X-ray pulsar Hercules X-1 was observed by the Astron space station during 1983-1987. In 1983 the pulsar was in the extended 'low' state, and its spectrum was similar to that in the 'off' state. Data on Hercules X-1 period changes in the 'high on' state are obtained. The possibility of accounting for the main pulse profile variations by a shadowing of the generation region due to disk precession is discussed. P.D.

A92-40759
OBSERVATIONS OF THE X-RAY PULSAR X-PER (4U 0352 + 30) BY THE GRANAT ORBITAL OBSERVATORY [NABLIUDENIIA RENTGENOVSKOGO PUL'SARA X-PER /4U 0352 + 30/ ORBITAL'NOI OBSERVATORIEI 'GRANAT']
G. G. BABALIAN, V. M. LOZNIKOV, M. N. PAVLINSKII, R. A. SIUNIAEV, and L. FILIPOV (Rossiiskaia Akademiia Nauk, Institut Kosmicheskikh Issledovanii, Moscow, Russia; Bulgarian Academy of Sciences, Institute of Space Research, Sofia, Bulgaria) Pis'ma v Astronomicheskii Zhurnal (ISSN 0320-0108), vol. 18, no. 4, April 1992, p. 303-314. In Russian. Apr. 1992 12 p In RUSSIAN refs
Copyright

An analysis of X-ray (4U 0352 + 30) observations by the ART-P telescope in the 3-30 keV energy range is presented. Results of source localization and a temporal analysis are adduced. Averaged and phase energy spectra of the pulsar, as well as the dependence of the modulation on energy, are constructed. P.D.

A92-43642
HARD X-RAYS FROM SUPERNOVA 1987A - RESULTS OF MIR-KVANT AND GRANAT IN 1987-1990 AND EXPECTATIONS
R. SIUNIAEV, S. GREBENEV, A. KANIOVSKII, V. EFREMOV, A. KUZNETSOV, M. PAVLINSKII, N. IAMBURENKO (Russian Academy of Sciences, Institute of Space Research, Moscow, Russia), J. ENGLHAUSER, S. DOEBEREINER, W. PIETSCH (Max-Planck-Institut fuer extraterrestrische Physik, Garching, Federal Republic of Germany) et al. IN: Gamma-ray line astrophysics; Proceedings of the International Symposium, Paris, France, Dec. 10-13, 1990 1991 7 p refs
Copyright

Results of the supernova 1987A hard X-ray observations in 1987-1990 with Mir-Kvant and Granat are presented. They make it possible to estimate the degree of Co-56 mixing over the envelope and set hard restrictions on abundances of radioactive Co-57, Ti-44, and Na-22 produced during the outburst. The upper limit at three standard deviation level on the Co-57/Co-56 ratio inside the envelope is equal to 1.5 of the earth's Fe-57/Fe-56 ratio. Future evolution of the SN1987A hard X-ray luminosity connected mainly with central source is discussed. Author

A92-46588
MODEL OF THE EVOLUTION OF SUPERSONIC MOTIONS IN MOLECULAR CLOUDS AND CHARACTERISTICS OF A FRAGMENTED MEDIUM [MODEL' EVOLIUTSII SVERKHZVUKOVYKH DVIZHENII V MOLEKULIARNYKH OBLAKAKH I KHARAKTERISTIKI FRAGMENTIROVANNOI SREDY]
IA. IU. OGUL'CHANSKII (Glavnaia Astronomicheskaia Observatoriia, Kiev, Ukraine) Kinematika i Fizika Nebesnykh Tel (ISSN 0233-7665), vol. 8, no. 3, May-June 1992, p. 3-13. In Russian. Jun. 1992 11 p In RUSSIAN refs
Copyright

A model for the fragmentation of a medium in molecular clouds under the effect of supersonic motions is suggested. A kinetic equation describing shock wave interactions is proposed and studied. The asymptotic velocity distribution of the shock waves is found, and the statistical characteristics of the clumps are estimated. The mass spectrum of the clumps becomes steeper and tends to the exponential spectrum with an exponent of approximately -3/2. P.D.

A92-51979
DYNAMICS OF THE MAGNETIZED PLASMA FLOW WITH MASS LOADING
A. A. GALEEV and I. KH. KHABIBRAKHMANOV (Rossiiskaia

Akademiia Nauk, Institut Kosmicheskikh Issledovanii, Moscow, Russia) (Planetary magnetospheric physics II; Proceedings of Symposium 5 and the Topical Meetings of the Interdisciplinary Scientific Commission B /Meetings B1 and B6/ of the COSPAR 28th Plenary Meeting, The Hague, Netherlands, June 25-July 6, 1990. A92-51951 22-91) Advances in Space Research (ISSN 0273-1177), vol. 12, no. 8, Aug. 1992, p. 323-326. Aug. 1992 4 p refs
Copyright

The stationary supersonic flow of mass-loaded plasma is examined theoretically to show that at a Mach number of two singular behavior occurs. A local positive increment of magnetosonic waves changes in sign at Mach 2 due to wave steepening or gradient catastrophe of the stationary solution. At greater Mach numbers the small-amplitude disturbances are smoothed, and the structure of the resulting cometary bow shock is considered for these conditions. The analysis demonstrates the feasibility of continuous mass-loaded plasma flow at Mach numbers not exceeding 2 during the deceleration of a contaminated flow well. As the Mach number is further reduced to approximately 1 the stationary solution is shown to have a stationary velocity spatial gradient that tends toward infinity. C.C.S.

A92-56649
THE RELIKT-1 EXPERIMENT - NEW RESULTS
I. A. STRUKOV, A. A. BRUKHANOV, D. P. SKULACHEV (Russian Academy of Sciences, Space Research Institute, Moscow, Russia), and M. V. SAZHIN (State Astronomical Institute, Moscow, Russia) Royal Astronomical Society, Monthly Notices (ISSN 0035-8711), vol. 258, no. 2, Sept. 15, 1992, p. 37P-40P. 15 Sep. 1992 4 p refs
Copyright

New results from reduction of data from the space experiment Relikt-1 (investigation of the anisotropy of the cosmic microwave background at 37 GHz) are presented. With 99 percent confidence, an anomalous signal is detected in a region of area of about 1 sr, centered at RA = 1 hr 30 m, Dec. = -10 deg (l = 150 deg, b = -70 deg). The brightness temperature of the signal is -71 +/- 43 micro-K with 90 percent confidence, including systematic errors. The nature of the signal cannot be explained by effects of the apparatus or by radio emission of known sources; there are reasons to believe that the signal has a cosmological origin. For a model of cosmological signal with scale-invariant spectrum, i.e., in terms of a power-law spectrum with n = 1, an estimate is presented, for the rms, of a quadrupole component of 6 x 10 exp -6 to 3.3 x 10 exp -5 with 90 percent confidence, including systematic errors. Author

N92-12972*# Academy of Sciences of the Ukrainian SSR, Kiev. Inst. of Space Research.
GAS FLOW AND GENERATION OF X RAY EMISSION IN WR+OB BINARIES
V. V. USOV *In* NAS-NRC, High-Energy Astrophysics. American and Soviet Perspectives p 394-402 1991
Avail: CASI HC A02/MF A04

The supersonic flow of the ionized gas in WR+OB binaries and X-ray generation are considered. X-ray emission is caused by gas heating up to temperatures of 10(exp 7) to 10(exp 8) K behind the front of shock waves. These are found in the collision of gas flowing out from the WR star with either the OB star's surface or the gas of the OB star's wind. The distribution of temperature and concentration behind the shock front are obtained. Using these distributions, the spectral power of bremsstrahlung X-ray emission of hot gas is calculated. Possible reasons that lead to a considerable difference between the observed parameters of X-ray emission of the WR binary of V 444 Cygni and the theoretically expected are discussed. Author

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LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

A92-12054* Institute of Space Research, Moscow (USSR).
ON THE POSSIBLE SOURCE OF THE IONIZATION IN THE NIGHTTIME MARTIAN IONOSPHERE. I - PHOBOS 2 HARP ELECTRON SPECTROMETER MEASUREMENTS
M. I. VERIGIN, K. I. GRINGAUZ, N. M. SHUTTE, S. A. HAIDER (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR), K. SZEGO, P. KIRALY (Central Research Institute for Physics, Budapest, Hungary), A. F. NAGY, and T. I. GOMBOSI (Michigan, University, Ann Arbor) Journal of Geophysical Research (ISSN 0148-0227), vol. 96, Nov. 1, 1991, p. 19,307-19,313. 1 Nov. 1991 7 p refs
(Contract NAGW-631)
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The measurements of electron spectra in the Martian magnetosphere by the HARP instrument on board the Phobos 2 orbiter are presented. The energy of the electrons (a few tens of electron volts) is sufficient for the impact ionization of the planetary neutral gas, and the characteristic flux of electrons (about 10 exp 8/sq cm per sec) could produce the nightside ionospheric layer with a peak density of a few thousands of electrons per cubic centimeter, which corresponds to densities observed earlier during radio occultations of the Mars 4 and 5 and Viking 1 and 2 spacecraft. The possibility of magnetospheric electron precipitation into the nightside atmosphere of Mars is in agreement with the mainly induced nature of the magnetic field in the planetary magnetotail (as at Venus), while the variability of the Martian nightside ionosphere may be explained by the partial screening of the atmosphere by a weak intrinsic magnetic field of the planet. Author

A92-12055
ON THE PROBLEM OF THE MARTIAN ATMOSPHERE DISSIPATION - PHOBOS 2 TAUS SPECTROMETER RESULTS
M. I. VERIGIN, K. I. GRINGAUZ, G. A. KOTOVA, N. M. SHIUTTE (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR), H. ROSENBAUER, S. LIVI, A. K. RICHTER (Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau, Federal Republic of Germany), W. RIEDLER, K. SCHWINGENSCHUH (Oesterreichische Akademie der Wissenschaften, Institut fuer Weltraumforschung, Graz, Austria), and K. SZEGO (Central Research Institute for Physics, Budapest, Hungary) Journal of Geophysical Research (ISSN 0148-0227), vol. 96, Nov. 1, 1991, p. 19,315-19,320. 1 Nov. 1991 6 p refs
Copyright

The measurements of proton spectra obtained by the TAUS spectrometer on board the Phobos 2 spacecraft in elliptical orbits near Mars are presented. A strong deceleration of the solar wind upstream of the Martian bow shock was revealed. It can be caused by the mass loading of the plasma flow by ions originating from the hot oxygen/hydrogen corona of Mars and/or by protons specularly reflected from the bow shock. In the first case, the deceleration of the solar wind by about 100 km/s implies that the hot oxygen corona of Mars could be several times denser than it was anticipated to be (at least during the observation period that was close to solar cycle maximum). Furthermore, the loss of planetary oxygen through the corona appears to be the main process of oxygen loss from Mars. The upper limit of loss rate for such a process is determined to be 10 exp 26 oxygen atoms or 2.5 kg of oxygen per second. Author

A92-15755
INFRARED SOLAR OCCULTATION SOUNDING OF THE MARTIAN ATMOSPHERE BY THE PHOBOS SPACECRAFT
V. A. KRASNOPOL'SKII, O. I. KORABLEV, V. I. MOROZ, A. A. KRYSKO (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow,

USSR), J. E. BLAMONT, and E. CHASSEFIERE (CNRS, Service d'Aeronomie, Verrieres-le-Buisson, France) Icarus (ISSN 0019-1035), vol. 94, Nov. 1991, p. 32-44. Nov. 1991 13 p refs
Copyright

Water vapor distribution data have been obtained for the Mars atmosphere from nine occultation profiles obtained by a Phobos spacecraft spectrometer. Mean mixing ratios of 150 ppm below 12 km are noted to decrease to 3 ppm at 40 km. The properties of aerosols in the Martian atmosphere are studied in view of measurements of the volume extinction coefficients and their spectral sloped in at 1.9 and 3.7 micron wavelengths. It is suggested that small scale water vapor density variations may be due to tides. O.C.

A92-18188
DEPICTION OF THE ACHIEVEMENTS OF ASTRONAUTICS IN MAP PRODUCTS [OTOBRAZHENIE DOSTIZHENII KOSMONAVTIKI V KARTOGRAFICHESKIKH PROIZVEDENIIAKH]
ZH. F. RODIONOVA Geodeziia i Kartografiia (ISSN 0016-7126), July 1991, p. 11-17. In Russian. Jul. 1991 7 p In RUSSIAN refs
Copyright

Various aspects of lunar mapping are described, with emphasis on the Soviet experience. The mapping of Mars and other planets is also briefly discussed. L.M.

A92-22698
TURBULENT PICK-UP OF NEW-BORN IONS NEAR VENUS AND MARS AND PROBLEMS OF NUMERICAL MODELLING OF THE SOLAR WIND INTERACTION WITH THESE PLANETS. I - FEATURES OF THE SOLAR WIND INTERACTION WITH PLANETS
T. K. BREUS and A. M. KRYMSKII (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR) Planetary and Space Science (ISSN 0032-0633), vol. 40, Jan. 1992, p. 121-130. Jan. 1992 10 p refs
Copyright

This paper deals with mass-loading near Venus. It is shown that heavy ions born upstream of the Venusian shockfront do not significantly change the solar wind (SW) parameters (in particular, Mach number). In the Venusian magnetosheath, the number of heavy ions undergoing acceleration in the large-scale field, which can be the source of the asymmetry and nonhydrodynamic properties of the plasma, is a few percent of the total ion flux from the dayside to the downstream mantle. The most intensive mass-loading of the SW flow is near the ionopause. Pick-up instabilities are possible there and plasma with two ion species will have hydrodynamic features due to turbulence resulting from instabilities. Author

A92-22699
TURBULENT PICK-UP OF NEW-BORN IONS NEAR VENUS AND MARS AND PROBLEMS OF NUMERICAL MODELLING OF THE SOLAR WIND INTERACTION WITH THESE PLANETS. II - TWO-FLUID HD MODEL
T. K. BREUS, A. M. KRYMSKII, and V. IA. MITNITSKII (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR) Planetary and Space Science (ISSN 0032-0633), vol. 40, Jan. 1992, p. 131-138. Jan. 1992 8 p refs
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A two-fluid hydrodynamic (HD) model with anomalous friction between ion species (protons and O+ ions) due to turbulence in the magnetosheath is suggested for solar wind (SW) interactions with Venus and Mars. The method of calculation and results are given for both planets. The results are compared with experimental data from the Pioneer-Venus and PHOBOS-2 spacecraft and also with the results of the one-fluid HD model with mass-loading. The results of the two-fluid HD model are in better agreement with the experimental data than those obtained earlier. Author

A92-26027
FIRST RESULTS OF A RADAR SURVEY OF VENUS BY THE MAGELLAN SPACECRAFT [PERVYE REZUL'TATY RADARNOI S'EMKI VENERY KA 'MAGELLAN']
A. T. BAZILEVSKII (AN SSSR, Institut Geokhimii i Analiticheskoi Khimii, Moscow, USSR) Astronomicheskii Vestnik (ISSN 0320-930X), vol. 25, Sept.-Oct. 1991, p. 548-568. In Russian. Oct. 1991 21 p In RUSSIAN refs
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An overview of a high-resolution radar survey of Venus as of May 1991 is presented. New phenomena were detected, namely: pancake features 20-25 km across, evidently formed by eruptions of viscous nonbasaltic lava; long 'channels', probably formed by the flow of low-viscosity liquids of the komatiite, carbonatite or sulfur-lava type; areas of polygonal, sometimes very regular gridlike, fracturing on volcanic plains; enigmatic flows originating within ejecta blankets of impact craters; and traces of wind erosion/accumulation of loose material. P.D.

A92-26036
PHOTOMETRIC PROPERTIES OF PHOBOS' REGOLITH DETERMINED FROM PHOBOS MISSION DATA [FOTOMETRICHESKIE SVOISTVA REGOLITA FOBOSA PO DANNYM MISSII 'FOBOS']
L. V. KSANFOMALITI (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR) Astronomicheskii Vestnik (ISSN 0320-930X), vol. 25, Nov.-Dec. 1991, p. 650-676. In Russian. Dec. 1991 27 p In RUSSIAN refs
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Results are reported of Phobos spectrophotometry in the range 300-600 nm based on data obtained by the KRFM spectrophotometer on board the Phobos spacecraft in 1989. The reflectivity of Phobos is found to have little in common with that in previous studies. It does not agree with reflectivity features of carbonaceous chondrites and does not permit unique identification with any other type of meteoritic material. In the 300-600-nm spectral range, a wide variety of the reflectivity features was observed to be connected with details of relief. P.D.

A92-26037
THE FLIGHT OF THE GALILEO SPACECRAFT PAST VENUS, THE EARTH, AND THE MOON [PROLET KA 'GALILEO' MIMO VENERY, ZEMLI I LUNY]
A. T. BAZILEVSKII (AN SSSR, Institut Geokhimii i Analiticheskoi Khimii, Moscow, USSR) Astronomicheskii Vestnik (ISSN 0320-930X), vol. 25, Nov.-Dec. 1991, p. 677-685. In Russian. Dec. 1991 9 p In RUSSIAN refs
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A summary is presented of results of scientific observations of Venus, the earth, and the moon from the Galileo spacecraft, which was launched to study the Jupiter system on a complex trajectory with gravity assists near Venus and the earth. The structure and dynamics of the Venus atmosphere were elucidated. No significant amounts of mafic material were found in the ejecta of the Orientale basin, which puts constraints on the excavation depth of the Orientale transient cavity (not more than 70 km). The existence of the giant (20,000 km across) South Pole-Aitken basin is confirmed. Spectral characteristics of the surface within the basin show a high content of mafic components, which implies the presence of buried mare lavas there or the excavation of mantle material by this basin. P.D.

A92-30308
REFINEMENT OF PHOBOS MAPS USING PHOTOGRAPHS FROM PHOBOS-2 [DOPOLNENIE KART FOBOSA PO SNIMKAM S AMS 'FOBOS-2']
V. I. KRAVTSOVA and E. G. KHAR'KOVETS Geodeziia i Kartografiia (ISSN 0016-7126), Dec. 1991, p. 28-31. In Russian. Dec. 1991 4 p In RUSSIAN refs
Copyright

Phobos-2 photographs were used to refine existing maps of Phobos. In particular, the photographs were used to refine the

U.S. geological survey map of Phobos. In addition, dark spots on the surface were identified from the Phobos-2 photographs which were not represented on existing maps. L.M.

A92-31973
PROFILES OF ELASTIC PROPERTIES FOR THE OLIVINE-PYROXENE MODEL OF THE LUNAR MANTLE - A THERMODYNAMIC APPROACH [PROFILI UPRUGIKH SVOISTV DLIA OLIVIN-PIROKSENOVOI MODELI MANTII LUNY - TERMODINAMICHESKII PODKHOD]
O. L. KUSKOV and G. V. IBODINOVA (Rossiiskaia Akademiia Nauk, Institut Geokhimii i Analiticheskoi Khimii, Moscow, Russia) Geokhimiia (ISSN 0016-7525), Jan. 1992, p. 13-19. In Russian. Jan. 1992 7 p In RUSSIAN refs
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A thermodynamic approach, based on the FeO-MgO-SiO2 fundamental system, is developed for the construction of petrological-geophysical models of the lunar mantle. Thermodynamic profiles of the elastic wave velocities are compared with seismic data, and preliminary constraints are identified for the contents of rock-forming oxides in the lunar matter. It is found that at least three factors affect the physical properties of lunar interior: temperature, concentration of SiO, and the Fe/(Fe + Mg) ratio. Calculations show that neither the olivine-pyroxene model depleted in iron nor the models enriched in silica can simultaneously satisfy the seismic constraints in both the upper and the middle lunar mantle, indicating that the lunar mantle is stratified with regard to chemical composition. I.S.

A92-32007
IS THE ANALYSIS OF THE OBSERVATIONAL DATA FROM THE VIKING-1 AND -2 SPACE VEHICLES ON THE OPTICAL CHARACTERISTICS OF THE MARS ATMOSPHERE RELIABLE? [DOSTOVEREN LI ANALIZ NABLIUDATEL'NYKH DANNYKH KOSMICHESKIKH APPARATOV 'VIKING-1 I -2' OB OPTICHESKIKH SVOISTVAKH ATMOSFERY MARSA?]
A. V. MOROZHENKO (Glavnaia Astronomicheskaia Observatoriia, Goloseevo, Ukraine) Astronomicheskii Vestnik (ISSN 0320-930X), vol. 26, Jan.-Feb. 1992, p. 28-38. In Russian. Feb. 1992 11 p In RUSSIAN refs
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Data on the optical properties of the Martian atmosphere and the nature of its high transparency obtained on the basis of observations from the Viking-1 and -2 have been analyzed. The analysis indicates that the values obtained for the effective radius of particles do not agree with the results of polarimetric observations, and that, in periods when images of the sun were obtained, the optical properties of the planet's atmosphere were unstable. It is contended that, since the latter was not taken into consideration when the Viking observations were processed, it can be concluded that the above data on the optical properties of the Martian atmosphere are erroneous. P.D.

A92-32012
SIZE SPECTRUM OF PARTICLES FORMED DURING METEORITE ABLATION IN MODEL CONDITIONS [SPEKTR RAZMEROV CHASTITS, OBRAZUIUSHCHIKHSIA PRI ABLIATSII METEORITOV V MODEL'NYKH USLOVIIAKH]
V. A. BRONSHTEN, V. N. ZELENIN, and S. G. MIKHEENKO (Rossiiskaia Akademiia Nauk, Komitet po Meteoritam; Moskovskii Inzhenerno-Fizicheskii Institut, Moscow, Russia) Astronomicheskii Vestnik (ISSN 0320-930X), vol. 26, Jan.-Feb. 1992, p. 72-76. In Russian. Feb. 1992 5 p In RUSSIAN refs
Copyright

Specimens of stony and iron meteorites as well as those of steel and basalt were exposed to a hot gas flow in an electrodeless arc plasmatron in order to study the size distribution of particles that separate during ablation. The size distribution of particles of remelt detached from the meteor body is well approximated by the log-normal law with two maxima which correspond to the following values of the aerodynamic mean particle diameters: 2-4 and 0.4-1.2 microns. The former is due to small particles formed by boundary effects in the process of the fragmentation of the melt flow, and the latter is due to the condensing particles. The mass loss rates obtained are in good agreement with the theoretical results of Bronshten (1983, 1985). P.D.

A92-32306
MANNED EXPLORATION OF MARS - REQUIREMENTS FOR FUTURE SPACE FLIGHT AND RECOMMENDATION FOR INTERNATIONAL COOPERATION [DIE BEMANNTE ERFORSCHUNG DES PLANETEN MARS - HERAUSFORDERUNG DER RAUMFAHRT FUER DIE ZUKUNFT UND FORDERUNG NACH INTERNATIONALER ZUSAMMENARBEIT]
RUDI G. REICHERT (Dornier GmbH, Friedrichshafen, Federal Republic of Germany) Astronautik (ISSN 0004-6221), vol. 28, Oct.-Dec. 1991, p. 103-106. In German. Dec. 1991 4 p In GERMAN refs
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The prospects for manned space flight projects in the USA, Russia, Europe, and Japan are briefly addressed. The possible achievements of the SEI are addressed. Affordable technologies for manned exploration of Mars are listed. C.D.

A92-36473
SCIENTIFIC PROBLEMS OF MARTIAN GEOMORPHOLOGY AND TECTONICS AND POSSIBLE ASPECTS OF THEIR STUDIES IN THE COMING FLIGHT TO MARS [NAUCHNYE PROBLEMY GEOMORFOLOGII I TEKTONIKI MARSA I VOZMOZHNYE ASPEKTY IKH IZUCHENIIA V PREDSTOIASHCHEM POLETE K MARSU]
IA. G. KATS, V. V. KOZLOV, E. D. SULIDI-KONDRAT'EV, and N. V. MAKAROVA IN: The life of the earth - Evolution of the earth and the planets 1990 14 p In RUSSIAN
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The paper discusses Martian tectonics and geomorphology, using the 1:20,000,000 scale maps constructed on the basis of space images obtained by the Mars-4 and -5, Mariner-9, and Viking-1 and -2 probes. The correlation between the old complexes of the Martian and lunar topographies made it possible to date the Martian complexes, which are identified on the basis of the principles used for identification of tectonic regions on earth. The maps identify volcanic belts, zones of riftogenesis in the western equatorial Mars region, zones of continent-ocean transition, the young tectonovolcanic elevations formed by lavas during the oceanic and postoceanic phases of tectonomagmatic activation, and the region of oceanic depressions. The data available to data make it possible to mark the basic cosmochronological boundaries separating the main stages of the planetary tectonic evolution. It is pointed out that one of the first projects of a future manned mission to Mars would be obtaining samples of Martian rocks from all known tectonic regions for subsequent chemical, geochemical, petrographical, and petrological analyses. I.S.

A92-39736
VENUSIAN IGNEOUS ROCKS
V. L. BARSUKOV IN: Venus geology, geochemistry, and geophysics - Research results from the USSR 1992 12 p
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Data on mineral compositions (and, in particular, the K2O/SiO2, U/K2O, and Th/K2O ratios) collected by the Venera 9, 10, 13, and 14 and Vega 1 and 2 spacecraft are compared with the same parameters for the terrestrial and lunar magmatic rocks, in order to classify Venusian magmatic rocks. The similarity found between the bulk chemical compositions of the Venusian and terrestrial basalts suggests that the material making up the upper mantle of Venus is compositionally akin to the terrestrial mantle material. It is suggested that the relative similarity of Venusian surface rocks to their petrological terrestrial equivalents in terms of K, U, and Th concentrations may indicate that the concentrations of these elements in the interior of Venus approximate those in the earth's interior. I.S.

A92-44063
THE SHADOW EFFECT FOR A PLANETARY SURFACE WITH GAUSSIAN MESORELIEF [TENEVOI EFFEKT DLIA POVERKHNOSTI PLANETY S GAUSSOVYM MEZOREL'EFOM]
IU. G. SHKURATOV and D. G. STANKEVICH (Astronomicheskaia Observatoriia, Kharkov, Ukraine) Astronomicheskii Vestnik (ISSN 0320-930X), vol. 26, no. 2, Mar.-Apr. 1992, p. 89-101. In Russian. Apr. 1992 13 p In RUSSIAN refs
Copyright

The Smith-Fuks method of calculating the shadow effect for a rough, planet-type surface is generalized for the case which takes into account a correlation for the propagation of incident and emergent light rays. The probability that surface points are both illuminated and visible is obtained for arbitrary azimuth and incident and emergent angles. For large angles of incidence and emergence the azimuth dependence has a sharp surge at the zero azimuth angle, which resembles the opposition effect of atmosphereless celestial bodies. A comparison of calculations and computer simulation shows satisfactory agreement. P.D.

A92-44100
REAL STRUCTURE AND THERMODYNAMIC PROPERTIES OF OLIVINE SOLID SOLUTIONS (FE/1-X/NI/X/)2SIO4 [REAL'NAIA STRUKTURA I TERMODINAMICHESKIE SVOISTVA OLIVINOVYKH TVERDYKH RASTVOROV /FE/1-X/NI/X/2SIO4]
L. P. NIKITINA, N. O. OVCHINNIKOV, and E. IU. KHIL'TOVA (Rossiiskaia Akademiia Nauk, Institut Geologii i Geokhronologii Dokembriia, St. Petersburg, Russia) Rossiiskaia Akademiia Nauk, Doklady (ISSN 0002-3264), vol. 322, no. 5, 1992, p. 959-962. In Russian. 1992 4 p In RUSSIAN refs
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Synthetic Fe-Ni olivines with Fe(2+) concentrations varying from 0.0 to 1.0 were investigated by X-ray diffraction analysis, Moessbauer spectroscopy, and thermodynamic analysis. Moessbauer studies and thermodynamic analysis in the context of a quasi-chemical model indicate the presence of phase transitions in solid solutions (Fe/1-x/Ni/x/)2SiO4 that are associated with changes in the short-range and long-range orders and are responsible for changes in the concentration dependences of the elementary cell volume and other structural characteristics of the solid solutions. V.L.

A92-49211
GALILEO FLYBY OF THE ASTEROID GASPRA [PROLET KA 'GALILEO' VBLIZI ASTEROIDA GASPRA]
A. T. BAZILEVSKII (Rossiiskaia Akademiia Nauk, Institut Geokhimii i Analiticheskoi Khimii, Moscow, Russia) Astronomicheskii Vestnik (ISSN 0320-930X), vol. 26, no. 3, May-June 1992, p. 3-7. In Russian. Jun. 1992 5 p In RUSSIAN refs
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The Galileo spacecraft flew by the asteroid 951 Gaspra on 29 Oct. 1991, took TV pictures of the asteroid, and made other observations. This paper describes one of the images that was delivered to the earth; the imaged part of the asteroid is 12 x 16 km across. The shape of the asteroid is rounded-angular, which is typical for bodies of fragmentation smoothed by impacts of small meteroids. L.M.

A92-50438
THE SOLAR WIND INTERACTION WITH MARS - A REVIEW OF RESULTS FROM EARLY SOVIET MISSIONS TO MARS
O. L. VAISBERG (Russian Academy of Sciences, Space Research Institute, Moscow, Russia) IN: Venus and Mars: Atmospheres, ionospheres, and solar wind interactions; Proceedings of the Chapman Conference, Balatonfured, Hungary, June 4-8, 1990 1992 16 p refs
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The three first orbiters of Mars, Mars-2 and Mars-3 in 1971-1972, and Mars-5 in 1974, provided the first measurements of the Martian plasma and magnetic field environment. Their orbits crossed only the external parts of the obstacle to the shocked solar wind flow. However, they allowed observation of a detached bow shock and the discovery of a very thick tail with a surrounding boundary layer containing traces of pick-up ions, and a 'cushion' of planetary plasma imbedded in moderately strong magnetic field that is connected to the downstream flow of planetary plasma in the tail. These results imply the strong interaction of the solar wind with the Martian atmosphere and allowed a first estimate of atmospheric losses due to the interaction with the solar wind. Arguments in favor of the existence of a weak, but significant, intrinsic magnetic field of Mars caused considerable debate among the investigators participating in the early missions. The view of some, that the induced magnetosphere model was in better agreement with the observations, is now supported by recent results. Author

A92-50439
THE PLASMA ENVIRONMENT OF MARS - PHOBOS MISSION RESULTS
A. V. ZAKHAROV (Russian Academy of Sciences, Space Research Institute, Moscow, Russia) IN: Venus and Mars: Atmospheres, ionospheres, and solar wind interactions; Proceedings of the Chapman Conference, Balatonfured, Hungary, June 4-8, 1990 1992 18 p refs
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The Phobos-2 spacecraft was operational in Martian orbit for almost two months (from 29 January to 27 March, 1989). The orbits and the on-board experiments allowed measurement of magnetic fields, the characteristics of plasma waves, and the spatial and spectral distribution and ion composition of particles in the equatorial regions of the Martian plasma environment. This review summarizes the first results of plasma investigations by the PHOBOS mission, published within one year after the completion of the mission. Author

A92-50441
THE SOLAR WIND INTERACTION WITH MARS OVER THE SOLAR CYCLE - A POST-PHOBOS VIEW
T. K. BREUS (Russian Academy of Sciences, Space Research Institute, Moscow, Russia) IN: Venus and Mars: Atmospheres, ionospheres, and solar wind interactions; Proceedings of the Chapman Conference, Balatonfured, Hungary, June 4-8, 1990 1992 17 p refs
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The results of previous missions to Mars (Mars 2, 3, 5) and the results of the Phobos-2 mission are compared. The features of the boundaries in the observed interaction of the solar wind with Comet Halley, Venus, and Mars, during periods of high and low solar activity are also described. It is shown that all of these bodies of the solar system are similar in some respect. Their one common feature is a cometopause-like composition boundary. However, this cometopause-like composition boundary is particularly prominent near the planets at solar maximum, when there is a high incident solar wind dynamic pressure. If Mars has a weak intrinsic magnetic field, the obstacle to the solar wind flow at Mars may be magnetospheric in nature during solar minimum. The obstable boundary at that time should look like the magnetopause at earth. At the same time, the boundary detected by Phobos-2 near the planet, and identified as the magnetopause or the planetopause, is probably not the effective obstacle where the balance with the solar wind dynamic pressure takes place. Author

A92-52130
THE MARTIAN ATMOSPHERE DISSIPATION PROBLEM - PHOBOS-2 TAUS EXPERIMENT EVIDENCES
M. VERIGIN (Russian Academy of Sciences, Space Research Institute, Moscow, Russia), H. ROSENBAUER (Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau, Germany), N. SHIUTTE, A. GALEEV, K. GRINGAUZ, G. KOTOVA (Russian Academy of Sciences, Space Research Institute, Moscow, Russia), S. LIVI (Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau, Germany), A. REMIZOV (Russian Academy of Sciences, Space Research Institute, Moscow, Russia), A. RICHTER (Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau, Germany), W. RIEDLER

A92-31937
DETERMINATION OF THE THERMODYNAMIC CONDITIONS IN THE CHROMOSPHERE ABOVE A SUNSPOT BY SOLVING AN INVERSE PROBLEM. I - NUMERICAL SIMULATION OF TEMPERATURE AND ELECTRON DENSITY DISTRIBUTIONS [OPREDELENIE TERMODINAMICHESKIKH USLOVII V KHROMOSFERE NAD SOLNECHNYM PIATNOM PUTEM RESHENIIA OBRATNOI ZADACHI. I - CHISLENNOE MODELIROVANIE RASPREDELENII TEMPERATURY I ELEKTRONNOI KONTSENTRATSII]
R. B. TEPLITSKAIA, V. G. SKOCHILOV, and S. A. GRIGOR'EVA (Sibirskii IZMIRAN, Irkutsk, Russia) Kinematika i Fizika Nebesnykh Tel (ISSN 0233-7665), vol. 8, Jan.-Feb. 1992, p. 3-11. In Russian. Feb. 1992 9 p In RUSSIAN refs
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A92-40667
THE SOLAR WIND VELOCITY AS DETERMINED FROM THE FREQUENCY DATA OF THE TWO-WAY RADIO SOUNDING OF THE SOLAR CORONAL PLASMA [SKOROST' SOLNECHNOGO VETRA PO CHASTOTNYM DANNYM DVUKRATNOGO RADIOPROSVECHIVANIIA OKOLOSOLNECHNOI PLAZMY]
V. P. IAKUBOV, O. I. IAKOVLEV, A. I. EFIMOV, and A. L. EROFEEV (Tomskii Gosudarstvennyi Universitet, Tomsk; Rossiiskaia Akademiia Nauk, Institut Radiotekhniki i Elektroniki, Moscow, Russia) Radiofizika (ISSN 0021-3462), vol. 34, no. 6, June 1992, p. 615-623. In Russian. Jun. 1992 9 p In RUSSIAN refs
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The correlation functions for phase and frequency fluctuations are analyzed for the case of two-way propagation of radio waves in the solar corona. It is shown that the correlation function has a distinct maximum at the time shift which depends on the velocity of corona irregularities and the distance between the radio link and the sun. A method for the determination of the solar wind velocity is presented, which is based on phase and frequency measurements during two-way radio occultation experiments. The theoretical data are compared with the experimental data obtained with radio sounding of the solar corona from the Venera-15,-16 spacecraft. O.G.

A92-40690
THE LARGE-SCALE STRUCTURE OF THE CIRCUMSOLAR PLASMA AS DETERMINED FROM SCINTILLATIONS [KRUPNOMASSHTABNAIA STRUKTURA OKOLOSOLNECHNOI SREDY PO MERTSANIIAM]
N. A. LOTOVA, I. IU. IUROVSKAIA, IA. V. PISARENKO (IZMIRAN, Troitsk, Russia), M. K. BIRD, M. PAETZOLD, R. GUESTEN, and W. SIEBER (Bonn, Universitaet, Federal Republic of Germany) Astronomicheskii Zhurnal (ISSN 0004-6299), vol. 69, no. 1, Jan.-Feb. 1992, p. 173-180. In Russian. Feb. 1992 8 p In RUSSIAN refs
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An occultation experiment using water vapor maser sources was conducted in December 1987. Five occultation sources were used simultaneously. Circumsolar plasma sounding was performed at the transition zone of the solar wind, where the subsonic outflow becomes supersonic. The large-scale configuration of the medium was reconstructed from results of studies of the scintillation index radial dependence. The relationship between the configuration of the solar wind transonic region and that of the solar corona is investigated. P.D.

A92-44145
PROCESS OF THE FORMATION OF THE SUPERSONIC SOLAR WIND [PROTSESS FORMIROVANIIA SVERKHZVUKOVOGO SOLNECHNOGO VETRA]
N. A. LOTOVA, O. A. KORELOV, and IA. V. PISARENKO (IZMIRAN, Akademgorodok, Russia) Geomagnetizm i Aeronomiia (ISSN 0016-7940), vol. 32, no. 3, May-June 1992, p. 78-84. In Russian. Jun. 1992 7 p In RUSSIAN refs
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Results of the probing of the circumsolar plasma at a wavelength of 2.9 m using 10 natural sources (quasars) are presented. It is shown that the formation of the supersonic solar-wind stream does not end within the limits of the SW transition region. Local increases of scattering in the plasma were also observed at distances of 50 and 70 solar radii from the sun. L.M.

A92-46591
DETERMINATION OF THERMODYNAMIC CONDITIONS IN THE CHROMOSPHERE ABOVE A SUNSPOT BY SOLVING AN INVERSE PROBLEM. II - NUMERICAL MODELING OF PRESSURE AND DENSITY DISTRIBUTIONS [OPREDELENIE TERMODINAMICHESKIKH USLOVII V KHROMOSFERE NAD SOLNECHNYM PIATNOM PUTEM RESHENIIA OBRATNOI ZADACHI. II - CHISLENNOE MODELIROVANIE RASPREDELENII DAVLENIIA I PLOTNOSTI]
R. B. TEPLITSKAIA, I. P. TUROVA, and V. G. SKOCHILOV (Sibirskii IZMIRAN, Irkutsk, Russia) Kinematika i Fizika Nebesnykh Tel (ISSN 0233-7665), vol. 8, no. 3, May-June 1992, p. 27-37. In Russian. Jun. 1992 11 p In RUSSIAN refs
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The temperature and electron density distributions are used to reconstruct the total pressure, mass density, and geometric height of the chromosphere above a sunspot. The hypothesis of hydrostatic equilibrium is not applied. The calculations are performed using a test model that simulates conditions in the chromosphere above the sunspot umbra. A criterion is formulated which makes it possible to use these calculations to determine whether equilibrium exists in the umbra chromosphere. It is suggested that the algorithm proposed will also make it possible to estimate the inclination of the sunspot flux tube axis within the framework of magnetohydrostatic equilibrium. P.D.

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SPACE RADIATION

Includes cosmic radiation; and inner and outer earth's radiation belts.

A92-12821
THE RADIATION ENVIRONMENT ON THE MIR ORBITAL COMPLEX DURING SEPTEMBER-OCTOBER 1989 [RADIATSIONNAIA OBSTANOVKA NA ORBITAL'NOM KOMPLEKSE 'MIR' V SENTIABRE-OKTIABRE 1989 G.]
I. N. ARESTOVA, V. I. LIAGUSHIN, B. V . MAR'IN, M. A. SARAEVA, M. V. TEL'TSOV, and P. I. SHAVRIN Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 29, Sept.-Oct. 1991, p. 794-797. In Russian. Oct. 1991 4 p In RUSSIAN refs
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Results of a study of the radiation environment on the Mir complex during September-October 1989 are presented. The radiation environment of this spacecraft on its trajectory were monitored by an onboard scintillation counter and ionization chamber. L.M.

A92-40776
ALL-UNION CONFERENCE ON COSMIC RAYS, DAGOMYS, RUSSIA, NOV. 1-3, 1990, PROCEEDINGS [VSESOIUZNAIA KONFERENTSIIA PO KOSMICHESKIM LUCHAM, DAGOMYS, RUSSIA, NOV. 1-3, 1990, MATERIALY]
Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaia (ISSN 0367-6765), vol. 55, no. 10, Oct. 1991, 208 p. In Russian. For individual items see A92-40777 to A92-40830. Oct. 1991 208 p In RUSSIAN
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The present conference on cosmic rays discusses features of the ground-level solar cosmic ray intensity increase on September 28, 1989, from neutron monitor data, large solar proton events at the beginning of the 22nd solar cycle, the solar cosmic ray maximum during the 22nd cycle, and the solar cosmic ray flare in March of 1990. Topics addressed include radiation dynamics along

the Mir spacecraft route during the solar proton event of September 29, 1989, accelerated particle dynamics in flare loops, the seasonal behavior of the daily intensities of muons with E not less than 220 GeV, and cosmic ray anisotropy and gradient in different structures of solar wind. Also examined are high-energy electron and positron energy spectra under the earth's radiation belt, Galactic cosmic ray intensity during the beginning of the sun's global magnetic field reversal, the propagation of cosmic rays in the magnetic field with large-scale inhomogeneities, and north-south asymmetry of the nonperiodic and quasi-periodic cosmic ray variations. P.D.

A92-40784
DYNAMICS OF THE RADIATION CONDITIONS ALONG THE ROUTE OF THE MIR STATION DURING THE SOLAR PROTON EVENT OF SEPTEMBER 29, 1989 [DINAMIKA RADIATSIONNYKH USLOVII NA TRASSE STANTSII 'MIR' VO VREMIA SOLNECHNOGO PROTONNOGO SOBYTIIA 29.IX 1989 G.]
V. V. BENGIN, V. S. MAKHMUTOV, V. A. SHURSHAKOV, V. M. PETROV, N. A. PANOVA, V. G. MITRIKAS, M. V. ZIL' (Institut Mediko-Biologicheskikh Problem, Moscow, Russia), TS. P. DACHEV, IU. N. MATVIICHUK, N. G. BANKOV (Bulgarian Academy of Sciences, Central Laboratory for Space Research, Sofia, Bulgaria) et al. (Vsesoiuznaia Konferentsiia po Kosmicheskim Lucham, Dagomys, Russia, Nov. 1-3, 1990, Materialy. A92-40776 16-93) Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaia (ISSN 0367-6765), vol. 55, no. 10, Oct. 1991, p. 1901-1903. In Russian. Oct. 1991 3 p In RUSSIAN refs
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The dynamics of an absorbed dose of cosmic radiation during the unique solar proton event of September 29, 1989 was measured during a Soviet-Bulgarian experiment with the Liulin dosimeter on board the Mir station. The intensity of the dose in calm conditions was (30 +/-6) x 10 exp -5 Gy/d. An additional absorbed dose conditioned by the above event was 310 x 10 exp -5 Gy. The results are compared with data on solar proton fluxes obtained by the GOES-7 satellite. P.D.

A92-40820
CONTRIBUTION OF NEUTRAL PARTICLES OF THE INTERSTELLAR MEDIUM TO COSMIC RAYS DETECTED IN INTERPLANETARY SPACE - ACCELERATION IN INHOMOGENEOUS CURRENTS [VKLAD NEITRAL'NYKH CHASTITS MEZHZVEZDNOI SREDY V KOSMICHESKIE LUCHI, REGISTRIRUEMYE V MEZHPLANETNOM PROSTRANSTVE - USKORENIE V NEODNORODNYKH TECHENIIAKH]
S. I. PETUKHOV and V. S. NIKOLAEV (Rossiiskaia Akademiia Nauk, Institut Kosmofizicheskikh Issledovanii i Aeronomii, Yakutsk, Russia) (Vsesoiuznaia Konferentsiia po Kosmicheskim Lucham, Dagomys, Russia, Nov. 1-3, 1990, Materialy. A92-40776 16-93) Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaia (ISSN 0367-6765), vol. 55, no. 10, Oct. 1991, p. 2030-2033. In Russian. Oct. 1991 4 p In RUSSIAN refs
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The paper determines the spatial distribution of neutral hydrogen atoms in interplanetary space, the intensity of the stimulated emission of protons, and their acceleration due to the latitudinal velocity gradient of solar wind and in fast solar wind flows. Attention is given to acceleration by the statistical mechanism as a result of ion interaction with turbulence in solar wind and to acceleration by the regular mechanism on a standing shock wave which limits the supersonic region of the solar wind current. P.D.

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OBSERVATIONS OF X RAY PULSARS FROM THE KVANT MODULE
M. GILFANOV, RASHID A. SUNYAEV, E. CHURAZOV, V. LOZNIKOV, V. V. EFREMOV, A. KANIOVSKIY, A. V. KUZNETSOV, N. YAMBURENKO, A. MELIORANSKIY, G. K. SKINNER et al. *In* NAS-NRC, High-Energy Astrophysics. American and Soviet Perspectives p 134-143 1991 Prepared in cooperation with Space Research Organization Netherlands, Utrecht; Birmingham Univ. (England); Max Planck fuer Physik and Astrophysik; and Tuebingen Univ. (Fed. Republic of Germany)
Avail: CASI HC A02/MF A04
The Roentgen international x ray observatory on the Kvant module of the Mir space station has been successfully operating since the beginning of June 1987. Many x ray sources were observed and among them were several x ray pulsars. Four telescopes mounted on board the Kvant module cover a wide energy range with good timing resolution. Timing analysis of the Kvant module data suffers from the presence of only short continuous intervals of source observations, separated by 90 min gaps (90 min is the orbital period of the Mir space station around the Earth). The presence of 90 min gaps leads to the appearance of beat frequencies v=v sub 0 + or - n/90 min (n = 1, 2, 3). Special analysis was applied to avoid this difficulty. Results are presented of the pulsation period measurements of the x ray pulsars Her X-1, Cen X-3, SMC X-1, Vela X-1, A0535 + 26 by the instruments on board the Kvant module in 1987 to 1989. The values of the periods are reduced to the solar system barycenter and to the binary system barycenter (excluding A0535 + 26).
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GENERATION OF ULTRAHIGH-ENERGY GAMMA RAYS IN ACCRETING X RAY PULSARS
YU. N. GNEDIN and N. R. IKHSANOV *In* NAS-NRC, High-Energy Astrophysics. American and Soviet Perspectives p 144-152 1991 Original language document was announced in IAA as A91-22005
Avail: CASI HC A02/MF A04
Relativistic protons producing ultrahigh energy gamma rays as a result of nuclear collisions ought to be generated in close proximity to the surface of a neutron star due to accretion. The main features of the mechanism in question are a high efficiency of conversion of the gravitational energy of the accreting matter into acceleration energy and a high efficiency of the acceleration itself. It is shown that in accretion to a neutron star with a strong magnetic field, a loss cone type distribution of accreting protons is formed, which due to instability effectively generates small scale Alfven and proton cyclotron waves, as well as nonlinear waves (magneto-acoustic and Alfven solitons). The electric field of the moving solitons may accelerate the protons to energies of greater than 10(exp 15) eV. The region of acceleration is not locally isolated, but extends from its surface. New possible sources of ultrahigh energy gamma rays are predicted. They may be binary x ray systems containing neutron stars with magnetic fields of about 10(exp 9) gauss.
Author

N92-12956*# Abastumani Astrophysical Observatory, Georgia (USSR).
ON THE NATURE OF PULSAR RADIATION
A. Z. KAZBEGI, G. Z. MACHABELI, and G. I. MELIKIDZE *In* NAS-NRC, High-Energy Astrophysics. American and Soviet Perspectives p 225-236 1991
Avail: CASI HC A03/MF A04
A key question in the interpretation of the emission of pulsars is that of the excitation and propagation of waves in the magnetospheric plasma. The magnetosphere of a pulsar has an extremely complex structure and there are many difficulties in the development of its self-consistent model. At present there exist some sufficiently well-grounded models not exactly agreeing with each other. However, the creation of a dense, relativistic, electron-positron plasma in the polar regions of a rotating neutron star magnetospheres is the point of similarity among these models. The pulsar radiation should be generated in such a plasma. The following subject areas are discussed: the pulse radiation mechanism and applications to the central object in SN1987A remnant.
Author

COMMONWEALTH OF INDEPENDENT STATES
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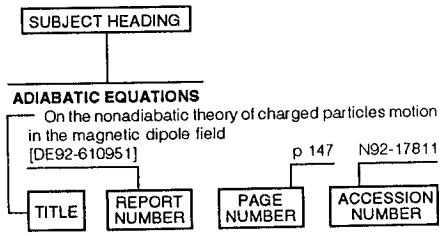

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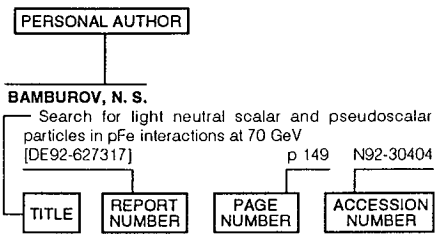

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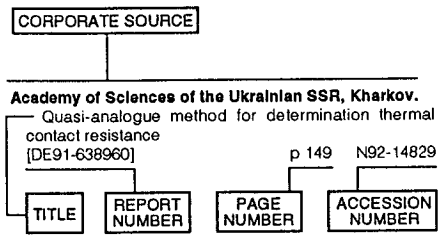

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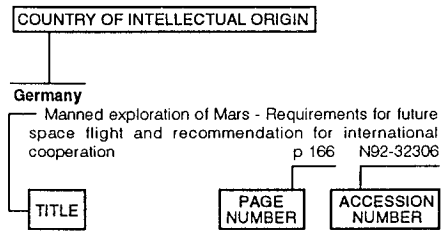

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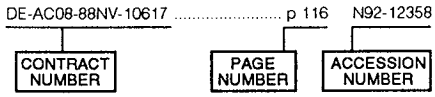

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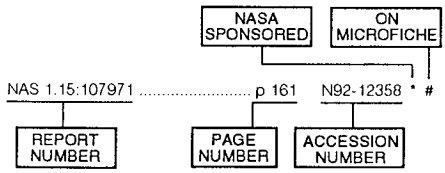

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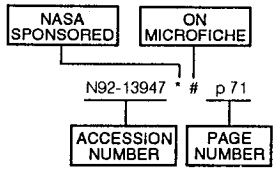

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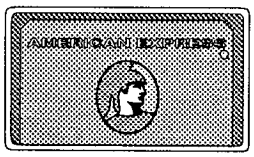

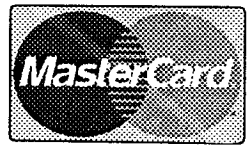

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